FINAL REPORT OF THE GROUNDWATER COMMISSION

Chapter 305, New Hampshire Laws of 2003

Chapter 287, New Hampshire Laws of 2005

November 2010

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EXECUTIVE SUMMARY

Climate change, land development and increases in population will affect the availability and use of groundwater in New Hampshire. The question of how and to what extent New Hampshire should manage it groundwater resources is complex. The groundwater commission (commission) worked over the last seven years to assess legal, administrative and technical aspects of how New Hampshire can improve the management of its groundwater resources. This working document will hopefully serve as reference to legislators and other policy makers striving to optimize the management of New Hampshire's water resources. The concepts and recommendations made herein are a compilation of numerous work efforts conducted by sub-committees, lead by the Commission. Sub-committees were staffed by commission members and in some cases included outside participants. The commission is comprised of representatives from a diverse range of interests that have not been in agreement in all cases, on actions taken or recommendations made herein. Therefore, the information herein should not be interpreted as an endorsement by individual commission members or the organizations they represent.

From 2003 through 2010, the commission completed it work by conducting over forty full commission meetings and numerous additional subcommittee meetings. These meetings are documented in detail in companion documents that provide an interim annual report of the commission that have been filed with the Legislature and New Hampshire State Library.

The work of the commission resulted in substantial improvements in the protection of the state's groundwater resources by:

- Developing requirements for and successively supporting the legislative establishment of a Water Use Registration and Reporting Program in statute;

- Developing requirements for, and successfully supporting the legislative establishment of statutory authority for municipalities to curtail residential lawn watering during a drought declared by the state or federal government;
- Developing requirements for and successfully supporting the legislative establishment of accurate construction and location data for new wells;
- Developing requirements for and successfully supporting the legislative establishment of rulemaking authority for the New Hampshire Department of Environmental Services (NHDES) to regulate certain types of geothermal processes to protect water quality;
- Developing language for and successfully supporting legislation clarifying municipal authority to regulate land uses that are not pre-empted by the state's large groundwater withdrawal (withdrawals that exceed 57,600 gallons over any 24-hour period) permitting process;
- Developing language and successfully supporting the legislative establishment of requirements for developing replacement, back-up, emergency and short-term use large groundwater withdrawals; and
- Successfully supporting the inclusion of funds in the state budget to expand the state's water level monitoring network.

The commission determined that New Hampshire has one of the most protective statutory approaches in the country for ensuring new large groundwater withdrawals do not adversely impact water users and water resources. The majority of commission members recommended not regulating large groundwater withdrawals that predate (developed prior to August 1998) the enactment of statutes pertaining to large groundwater withdrawals. The commission determined that under common law, groundwater is probably considered to be part of the "Public Trust", but that case law in New Hampshire has not confirmed this. The commission believes that other common law concepts such as "Police Powers" and "Parens Patriae" in tandem with existing statutory law, provide

sufficient authority for the state to take action to protect groundwater with the same effect of groundwater being protected under the "Public Trust" doctrine.

The commission found that international trade or services agreements do not pose a significant risk to undermining New Hampshire's authority to protect water resources as long as New Hampshire's regulatory process for evaluating withdrawal proposals is fair and consistently applied in a transparent manner to all withdrawal proposals. The commission found that some aspects of international trade and service agreements may allow a tribunal administering dispute proceedings to make injudicious decisions pertaining to the state's regulation of groundwater. The commission deemed that this could be the case with any contested case involving a natural resources and international agreements. The commission believes that the state Attorney General and the Legislature's International Trade Commission should continue to evaluate these matters and make appropriate recommendations to the Federal Government which has the authority to enter into these trade agreements with other countries.

The commission determined that the state did not have sufficient data to establish a hierarchy of water users. The commission developed an approach for establishing a water user hierarchy that prioritize the protection of human health and considered the overall public benefit associated with large uses of water. The commission identified data the state should begin collecting if it were to implement a water use hierarchy in the state.

As required by legislative statute, the commission studied water use fees as part of its duties. The commission evaluated the application of water use fees to generate revenue to finance groundwater water protection initiatives developed during the course of the commission's work in order to assist in monitoring, protecting and managing the state's groundwater resources. The commission developed a report that provides basic information about how water use fees could equitably be applied if this funding approach is considered in the future.

The commission found that an equitable approach for implementing water use fees would be to share the costs associated properly managing the resource across all water users.

The commission began assessing how the state can improve water quality protection. The commission recommended that the State establish a water quality testing requirement for new private wells and when existing homes are sold. The commission determined that NHDES is currently addressing overall water quality protection and should continue assessing appropriate land uses near wells, how to improve municipal/local groundwater quality protection assistance, and how future well sites should be protected in state.

The commission also examined groundwater management data needs. The commission determined that New Hampshire is not adequately monitoring its groundwater resources. The commission developed an appropriate groundwater monitoring network for the state that could be used to monitor long-term water quantity and quality trends in the state if funding was made available.

LEGISLATIVE HISTORY

The commission was created in 2003 pursuant to Senate Bill 155 (see Attachment A). The commission was originally charged with assessing: 1) Ways to clarify the hierarchy of water uses while considering existing private property rights; 2) How to bring a balanced approach to water use among residential, public water supply, industrial, commercial, agricultural, energy, recreational, and other water users; and 3) How to improve the current process by which new water users may reasonably and efficiently use state water resources, including consideration of potential regional impacts and local water management issues, in order to best protect and preserve an adequate supply of water for the state with particular attention to groundwater. The membership of the commission was also established by Senate Bill 155 and consisted of the following:

- Three members of the senate
- Three members of the house of representatives
- A representative of public water supplier interests
- The commissioner of the department of environmental services
- One member of a regional planning commission
- A representative of the International Bottled Water Association
- Two members of the public
- Two representatives of different business water users
- A representative of municipal interests
- A representative of the Society for the Protection of New Hampshire Forests
- A representative of the New Hampshire Farm Bureau
- A representative of recreational interests
- A representative of the joint board of professional engineers, architects, land surveyors, foresters, professional geologists, and natural scientists
- A representative of the New Hampshire Association of Conservation Commissions
- A representative of construction and mining activities

The names of the actual members of the commission representing the positions above are listed in the annual reports the commission issued from 2003-2010. The annual reports also contain minutes of meetings that occurred which list the members that were present.

Senate Bill 142 was passed in 2005 and extended the life of the commission established by Senate Bill 155 of 2003 from November 30, 2004 to November 30, 2008. Senate Bill 142 also required that the commission issue interim reports by November 30th of each year, and that a final report be submitted by November 30, 2008. Senate Bill 142 further clarified the topics the commission should assess, including the concept of applying a fee for the consumptive use of water.

In 2006 the General Court enacted House Bill 1609 which required NHDES to conduct a pilot groundwater management plan for a geopolitical area of the Seacoast. House Bill 1609 specifically required the NHDES to report its findings to the commission. NHDES report of its findings can be found in the 2009 Annual Report

House Bill 1353 was passed in 2008 and extended the life of the commission from November 30, 2008 to November 1, 2010. House Bill 1353 also required that the commission assess the role of municipalities in the large groundwater withdrawal permitting process, assess the concept of establishing "public benefit" criteria for new large groundwater withdrawals and assess the role of municipalities in the large groundwater withdrawal permitting process.

Senate Bill 56 was passed in 2010 and required that the commission assess if New Hampshire should establish financial assurance requirements for large groundwater withdrawals.

GROUNDWATER COMMISSION SPONSORED LEGISLATION

The commission was charged with making recommendations to improve groundwater management to the Legislature. Some of the recommendations contained in its annual reports have been acted upon by the Legislature. These are summarized below.

Water Use Reporting and Groundwater Level Monitoring

In 2005, the Legislature approved House Bill 215, which established RSA 488 - Water Management. This law clarifies that entities that withdraw, transfer, or discharge more than 20,000 gallons a day have to register with and report water use to NHDES. The law also established standards for enforcement, including inspections by NHDES, and fines for violations that are not corrected after a written warning was provided. Accurate water use data is required to effectively

assess and appropriately manage water resources. The history behind House Bill 215 is summarized in the 2003 and 2005 annual reports of the commission. The commission also recommended to the Legislature in 2005 that it fund an expansion of the ambient bedrock monitoring network in New Hampshire. The Legislature partially funded this request in the 2006-2007 budget. Monitoring bedrock water level and quality conditions is critical for assessing long-term trends and management of the resource.

Residential Lawn Watering Restrictions During Drought

In 2007, the Legislature approved House Bill 457, which established RSA 41:11-d – Restricting the Watering of Lawns. This law enables municipalities to restrict residential lawn watering, even if private wells are the source of water, when the State or Federal government declares a stage of drought. Prior to the enactment of RSA 41:11-d, the state and municipalities did not have clear authority restrict excessive discretionary water uses from non-regulated withdrawals, even if a water supply emergency existed. This was evident during abnormally dry periods that occurred from 2001-2003. During this time, residential wells pumping high volumes of water for lawn watering impacted neighboring wells and municipalities and the state were not able to curtail these discretionary water uses during the water supply emergency.

Accurate Well Records and Well Locations

In 2007, the Legislature approved House Bill 459, which amended RSA 482-B:10 to require that licensed well drillers provide accurate well location data to NHDES. The commission identified maintaining an accurate database of wells and associated geologic material as a fundamental step New Hampshire must take to assess and manage its water resources. The commission also noted that complete and accurate information on wells is necessary to assess if a proposed large groundwater withdrawal may impact other water users.

Replacement and Back-Up Wells

In 2007, the Legislature established RSA 485-C:22 via the enactment of House Bill 458, which exempts the installation of a replacement well or redundant wells from complying with the requirements of RSA 485-C:21. The commission noted that the installation of a back-up well or replacement well, if no new impacts to the environment occurs, should be exempt from having to obtain a large groundwater withdrawal permit.

Private Well Sampling

In 2010, the Legislature considered House Bill 1685, which proposed to require water quality tests be conducted on water derived from newly constructed private wells and from private wells providing drinking water at the time of a real estate transaction. The commission developed and recommended this legislation because approximately forty-four percent of the state's population obtains its drinking water from private wells. The commission noted that New Hampshire's aquifers are susceptible to man-made and natural occurring contaminants, yet most private well owners do not adequately monitor the quality of their water supply. The Legislature did not approve House Bill 1685.

Effect of State Regulation of Large Groundwater Withdrawals on Local Ordinances/Short-Term Uses/Geothermal Wells

In 2010, the Legislature adopted Senate Bill 411 which amended several provisions of RSA 485-C. Senate Bill 411 amended RSA 485:20 to clarify that the state regulation of large groundwater withdrawals does not pre-empt the municipality's existing authorities to regulate other aspects of a project. Senate Bill 411 also established RSA 485-C:23 and 485-C:24 to clarify the regulatory requirements for short-term and emergency large groundwater withdrawals. Lastly RSA-485-C:25 exempted large groundwater withdrawals associated with geothermal processes where the volume of groundwater extracted minus the volume of water returned to the same aquifer does not exceed 57,600 gallons over any 24-hour period.

FINDINGS

Large Groundwater Withdrawal Permitting

The commission studied the scope and process for permitting large groundwater withdrawals in New Hampshire. The commission also researched and considered how other eastern water law states permit large groundwater withdrawals. A detailed record of the commission's work on this topic can be found in the 2006 and 2010 annual reports. Attachment B contains a table summarizing the work of the subcommittee on this topic.

The commission determined that the existing process for permitting large groundwater withdrawals adequately protected water users and water resources. The commission also determined that there is no technical basis for establishing additional requirements for commercial users of groundwater.

In its 2006 Annual Report, the commission determined that the role of local government in the permitting process is adequate. The commission noted that New Hampshire requires two public hearings, two written public comment periods, that copies of all documents are provided to municipalities, and that municipalities have intervener status during the permitting process. The commission found that the role of local government in the permitting process is more extensive than other states. The commission noted that it is appropriate for the state to have jurisdiction to regulate groundwater and that state jurisdiction to regulate groundwater is also consistent with all other states operating under an eastern water law system. Because of House Bill 1353 of 2008, the commission re-evaluated this issue in 2009 and 2010. The commission provided its findings on the work required by House Bill 1353 in a separate report to the Legislature (see page 17 – "The Local Role in Managing Groundwater").

The commission determined that local permitting should not have to be obtained before NHDES reviews a large groundwater withdrawal application. The commission found that many local governments prefer to have the state

permitting process occur first or in tandem with the local permitting process. In this manner, the local planning board can integrate its findings and decisions made for a project with state findings and decisions on permit applications.

The commission found that NH currently ensures the public interest is protected when new large groundwater withdrawals are proposed. State law does stipulate criteria for protecting water supplies and water resources. The commission noted that enacting a general requirement of stipulating protection of "public interest" would have little meaning and be subjective without clearly defining what "public interest" means. The commission noted that in some other states, the protection of "public interest" is included in law, but not defined, boards of elected or appointed officials make determinations on proposed water withdrawals. The commission agreed that technical decisions on water supply projects are more appropriate for regulating water.

The commission found that there is no need for additional permitting requirements or criteria for withdrawals that will result in an inter-basin transfer. The commission noted that the existing large groundwater withdrawal permitting process factors into the permitting process the significant displacement of large volumes of water from a watershed or aquifer.

In 2006, the commission noted that withdrawals from groundwater fed ponds were not subject to the large groundwater withdrawal permitting requirements. The commission determined at that time that groundwater withdrawals from groundwater fed dug ponds would not be common-place and warrant extensive regulation to prevent regional impacts from occurring. The subcommittee noted that often, groundwater fed dug ponds store stormwater run-off or surface water skimmed from a nearby river during high flows. In 2009, when NHDES re-adopted the regulations pertaining to large groundwater withdrawals, it included provisions that require large groundwater withdrawals from groundwater dependant dug ponds obtain a large groundwater withdrawal permit.

The commission noted that subdivision housing developments are installing numerous private wells instead of developing a community water system that would require a large withdrawal permit for its water sources.

The commission noted that NHDES had developed policies to address the issue of entities increasing withdrawals from wells developed prior to August 1998 (the effective date of the large withdrawal permitting statute) and avoiding the large groundwater withdrawal permitting process. The commission noted that withdrawals from these wells have potentially caused only one documented occurrence of an unmitigated impact to a private well. The commission developed language to a "conflict resolution" approach for withdrawals from wells constructed prior to August 1998 (see Attachment B). However, the commission voted to not recommend the enactment of language into law until it can be demonstrated that this type of protection measures are necessary.

The commission found that the amount of land owned by an applicant should not be directly considered as criteria when permitting new large groundwater withdrawals. Under the current permitting process, this concept is indirectly considered given the water availability and impact assessments that occur. A person proposing a large withdrawal that owns a lot of land would most likely have to address a lower number of environmental impacts. This is because a large number of other water users would not likely be located nearby, and there would be a lower number of other competing water users within the watershed and aquifer.

The concept of linking a large withdrawal to the amount of land owned has been considered by the Legislature multiple times over the last ten years. The Legislature has not supported this concept. In general, issues with zoning/sprawl, impractical land ownership requirements and identifying the technical or scientific rationale for doing this have been reasons for legislative

committees to decline supporting this concept. The commission noted that directly relating state regulation of groundwater withdrawals to the amount of land owned is not consistent with historical eastern water law concepts.

As noted in the Groundwater Commission Sponsored Legislation section of this report, the commission found that municipalities should have authority to limit water use for lawn water during droughts. In the same section, the commission also found that accurate well construction records with geospatial data for new wells are critical for ensuring water users are protected from impacts associated with large groundwater withdrawals.

Clarification of Groundwater Quantity Law and Legislative Authorities

The commission assessed if it was important to further clarify that groundwater is part of the Public Trust Doctrine and, if so, how is that best achieved. The commission also assessed if there is a risk to NH related to allowing the commercial use of groundwater in products that are sold in countries that the United States is in an international trade agreement with? A detailed record of the commission's work on this topic can be found in Attachment C.

The commission found that groundwater was in fact protected as though it were part of the public trust both by statute and under common (court/judge made) law. The commission believes that other common law concepts such as "Police Powers" and "Parens Patriae" in tandem with existing statutory law, provide sufficient authority for the state to take action to protect groundwater with the same effect of groundwater being protected under the "Public Trust" doctrine. Accordingly, the commission determined it is unnecessary to take any further action to clarify this issue.

The commission found that international trade agreements do not pose a significant risk to New Hampshire's authority to protect its groundwater. The commission also made the following findings:

- This issue is far broader than water withdrawal regulation and would apply to all resources used in manufacturing products that are sold in countries subject to trade agreement requirements, and;
- While there is always uncertainty on how a group of international judges will decide any case brought before them, actions to date suggest that as long as there are clear environmental protection regulations and they are consistently applied, there is not a substantial risk that protection would be limited or compensation required as a result of international trade agreements.
- Because these agreements are new and evolving, there continues to be concerns about this issue, the Department of Justice should issue another opinion on what risk the state incurs in regulating the use of our natural resources for manufacturing products with the potential to be sold to countries that the US has trade agreements with. (Note: Since this time, the Citizens Commission on Trade, which includes the Department of Justice, was formed in 2006 via the passage of SB 162. They will be dealing directly with this and other issues concerning the impact of trade agreements in NH).

Hierarchy of Groundwater Users

The commission identified and reviewed the purpose and structure of other states' water use hierarchies. This information is included in the 2009 Annual Report.

The commission found that the New Hampshire Drought Management Plan was developed in 1990 and has not been updated since that time. The commission found that the document does not establish a water use hierarchy of any kind. Rather, the plan provides information for classifying the duration and severity of

drought as well as recommended conservation measures that can be implemented. Not withstanding any changes in state law, only the Governor, by declaring a state-of-emergency, could establish a hierarchy of water users if a water supply emergency existed.

The commission then developed two approaches for establishing water use hierarchies that are: 1) Justifiable based on sound technical data; 2) Nondiscriminatory; and 3) Necessary to protect the public water resources. The commission found that sufficient data does not exist to fully administer a water use hierarchy in New Hampshire that meets these criteria. The commission identified the data that would be required to begin to more definitively develop a specific water use hierarchy in New Hampshire. In completing its work, the commission identified the following as the most important outcomes associated with the use of water (not listed in priority):

- Protection of Human Health and Safety;
- Economic Prosperity;
- Environmental Quality;
- Quality of Human Life; and
- Food Supply

The commission found that water uses associated with meeting drinking water, health and sanitation needs are always the highest priority and that for community water systems, the amount of water used to directly meet drinking water, health, or sanitation would be the highest priority. The commission also identified a number of attributes associated with an activity or entity using water as being important to consider when forming a water use hierarchy. These attributes describe the measures that are being implemented to improve overall water availability and can help mitigate shortages in drought include and are summarized as follows (not in order of priority):

- Is all the water to be used essential for public health (i.e. drinking water consumption, reasonable bathing, medical requirements and sanitation)?

- Has water use efficiency been maximized by the user?
- Is there no other available alternative water supply for this purpose that is more abundant/ protected/safe? Has the water user diversified its water supplies to prepare for droughts?
- Is the water use nonconsumptive? Does the water use result in significant water being returned to the same hydrologic system in close proximity to the source that it is withdrawn from?
- Is the water use a non discretionary consumptive water use of less than 10,000 gallons per day for water uses other than uses associated with public health?
- Does the user utilize lower quality water over a higher quality as much as possible?
- What is the public benefit associated with the water use in terms of employment or state economic impact?
- What concessions or mitigation measures has a water user implemented to assist with mitigating the water supply emergency?
- How does the water user impact stormwater and wastewater within the aquifer and watershed? Are these resources being maintained in a sustainable manner?

The commission developed and evaluated two approaches for assessing the outcomes and attributes as they relate to a water use hierarchy during a water supply shortage. This work can be referenced in the future as needed and if the necessary data is collected to implement a hierarchy of water users. The commission also developed a list of measures that water users can take to mitigate the potential of water supply shortage and thus a need for a water user hierarchy. The commission's full report on the hierarchy of water users can be found in Attachment D.

Fee on the Commercial Consumptive Use of Groundwater

As required by statute, the commission studied water use fees as part of its duties. The commission evaluated the application of water use fees to generate revenue to finance groundwater water protection initiatives developed during the course of the commission's work in order to assist in monitoring, protecting and managing the state's groundwater resources. The commission recognized that there are several other state and local revenue generating mechanisms that could be used to fund groundwater water resources protection and management efforts in New Hampshire and made no findings relative to these funding mechanisms versus application of water use fees. However, the Legislature specifically stipulated that the concept of water withdrawal fees should be studied by the groundwater commission. The commission developed a report that provides basic information about how water use fees could be applied if this funding approach is considered in the future. The commission's full report on water use fees can be found in Attachment E.

Protecting Groundwater Quality to Ensure Availability

The commission began assessing how the state can improve water quality protection in the State. The commission recommends that the state establish a water quality testing requirement for new private wells and when existing homes are sold. The Legislature considered, but did not adopt this recommendation in 2010. The commission also successfully supported legislation in 2009 to enable NHDES to develop rules to regulate the fluids used in closed-loop geothermal processes and to ensure open-loop geothermal process where brackish or salt water exists does not contaminate freshwater. The commission determined that NHDES should continue assessing appropriate land uses near wells, how to improve municipal/local groundwater quality protection assistance, and how future well sites should be protected in state. The commission also noted that in 2009, NHDES coordinated a Source Water Protection Strategy Workgroup which focused on protecting the quality of groundwater in New

Hampshire. Attachment F provides a full summary of the commission's work on this topic.

Groundwater Management Data Needs

The commission, in consultation with academia, industry consultants and the United States Geological Survey, developed and generally supported a Groundwater Data Needs Report. The commission found that the current groundwater monitoring network does not provide adequate information about current groundwater conditions or to understand long-term trends. The commission identified a need for the state to expand its groundwater level and water quality monitoring network in order to provide adequate data to manage water resources and understand long-term trends in water quantity and quality. The report also recommends that the monitoring network be automated to provide a higher resolution data set and to decrease personnel costs associated with data collection. The report also quantified the costs associated with expanding the groundwater monitoring network. The report summarized other data needs such as increased geologic mapping. Attachment G provides a full summary of the commission's work on this topic.

The Local Role in Managing Groundwater

A subcommittee of the Groundwater Commission ("HB 1353 Subcommittee") rigorously studied the existing regulatory process in New Hampshire for regulating groundwater withdrawals and met with municipal officials the general public and water suppliers at thirteen public meetings throughout the State as a way of illuminating issues related to the state and municipal role in sustainable groundwater resource management. Recognizing that land use planning and regulation at the municipal level ultimately affects how water resources are used, the subcommittee found that there is a need to expand a municipality's role in groundwater management in New Hampshire and the Large Groundwater Withdrawal Permitting Process in order to effectively evaluate proposed

withdrawals in the context of long-term sustainability and public benefit. The work of the subcommittee and its detailed recommendations can be found in a companion document titled "*Permitting and Regulation of Large Groundwater Withdrawals in New Hampshire – Final Recommendations – Appropriate Roles for Municipalities and Consideration of Criteria that Should Be Used*" and dated November 2010. The report contains detailed proposals to: 1) Allow for the consideration of the protection of future water needs; 2) The regulation of withdrawals that are below the large groundwater withdrawal permitting threshold of 57,600 gallons over any 24-hour period; and 3) Improvements to the public and municipal participation component of the large groundwater withdrawal permitting process.

Attachment A

Legislation Pertaining to the Establishment of the Groundwater Commission

CHAPTER 305

SB 155 - FINAL VERSION

STATE OF NEW HAMPSHIRE

In the Year of Our Lord Two Thousand Three

AN ACT establishing a commission to study issues relative to groundwater withdrawals.

Be it Enacted by the Senate and House of Representatives in General Court convened:

305:1 Commission Established. The general court recognizes that the waters of New Hampshire are a precious and invaluable resource upon which there is an ever increasing demand for existing, new, and competing uses. The general court further recognizes that an adequate supply of groundwater for domestic, agricultural, industrial, and recreational uses and for fish and wildlife is essential to the health, safety, and welfare of the people of New Hampshire. Therefore, there is hereby established a commission to study ways to clarify the hierarchy of water uses while considering existing private property rights, to bring a balanced approach to water use among residential, public water supply, industrial, commercial, agricultural, recreational and other water users, and to review the current process by which all such new water users may reasonably and efficiently use state water resources, including consideration of potential regional impacts and local water management issues, in order to best protect and preserve an adequate supply of water for the state.

305:2 Membership and Compensation.

I. The members of the commission shall be as follows:

(a) Three members of the senate, appointed by the president of the senate.

(b) Three members of the house of representatives, appointed by the speaker of the house.

(c) A representative of public water supplier interests, nominated by the New Hampshire Water Works Association, and appointed by the governor.

(d) The commissioner of the department of environmental services, or designee.

(e) One member of a regional planning commission, nominated by the New Hampshire Association of Regional Planning Commissions, and appointed by the governor.

(f) A representative of the International Bottled Water Association, nominated by the association, and appointed by the governor.

(g) Two members of the public, appointed by the governor.

(h) Two representatives of different business water users, nominated by the Business and Industry Association of New Hampshire, and appointed by the governor.

(i) A representative of municipal interests, nominated by the New Hampshire Municipal Association, and appointed by the governor.

(j) A representative of the Society for the Protection of New Hampshire Forests, nominated by the society, and appointed by the governor.

(k) A representative of the New Hampshire Farm Bureau, nominated by the bureau, and appointed by the governor.

(l) A representative of recreational interests, appointed by the governor.

(m) A representative of the joint board of professional engineers, architects, land surveyors, foresters, professional geologists, and natural scientists who shall be a hydrologist or geologist, appointed by the governor.

(n) A representative of the New Hampshire Association of Conservation Commissions, nominated by the association, and appointed by the governor.

(o) A representative of construction and mining activities, nominated by the Associated General Contractors of New Hampshire, and appointed by the governor.

II. Legislative members of the commission shall receive mileage at the legislative rate when attending to the duties of the commission.

305:3 Duties. The commission shall study ways to bring a balanced approach to water use among residential, public water supply, industrial, commercial, agricultural, energy, recreational, and other water users, and to improve the current process by which new water users may reasonably and efficiently use state water resources, including consideration of potential regional impacts and local water management issues, in order to best protect and preserve an adequate supply of water for the state with particular attention to groundwater. This study shall include consideration of issues such as potential impacts on New Hampshire's environment, property rights as they relate to groundwater, possible fees on water withdrawals, and the protection of New Hampshire's aquifers.

The commission may address other issues related to water.

305:4 Chairperson; Quorum. The members of the commission shall elect a chairperson from among the members. The first meeting of the commission shall be called by the first-named senate member. The first meeting of the commission shall be held within 45 days of the effective date of this section. Eight members of the commission shall constitute a quorum.

305:5 Report. The commission shall make an interim report of its findings and any recommendations for proposed legislation to the senate president, the speaker of the house of representatives, the senate clerk, the house clerk, the governor, and the state library on or before November 1, 2003. The commission shall make a final report of its findings and any recommendations for proposed legislation to the senate president, the speaker of the house of representatives, the senate clerk, the house clerk, the governor, and the state library on or before November 30, 2004.

305:6 Effective Date. This act shall take effect upon its passage.

(Approved: July 18, 2003)

(Effective Date: July 18, 2003)

CHAPTER 287

SB 142 – FINAL VERSION

STATE OF NEW HAMPSHIRE

In the Year of Our Lord Two Thousand Five

AN ACT extending the reporting date of the commission to study issues relative to groundwater withdrawals.

Be it Enacted by the Senate and House of Representatives in General Court convened:

287:1 Commission to Study Issues Relative to Groundwater Withdrawals; Reporting Date Extended. Amend 2003, 305:5 to read as follows:

305:5 Report. The commission shall make an interim report of its findings and any recommendations for proposed legislation to the senate president, the speaker of the house of representatives, the senate clerk, the house clerk, the governor, and the state library on or before November 1, 2003. The commission shall make [~~a final report~~] ***additional interim reports*** of its findings and any recommendations for proposed legislation to the senate president, the speaker of the house of representatives, the senate clerk, the house clerk, the governor, and the state library on or before November 30[~~, 2004~~] ***of each year, with the final report due on or before November 30, 2008. The senate environment and wildlife committee and the house resources, recreation and development committee shall have oversight responsibility for the progress of the commission and shall receive copies of all interim reports***.

287:2 Effective Date. This act shall take effect upon its passage.

(Approved: July 22, 2005)

(Effective Date: July 22, 2005)

CHAPTER 31

SB 56 – FINAL VERSION

STATE OF NEW HAMPSHIRE

In the Year of Our Lord Two Thousand Ten

AN ACT expanding the duties of the commission to study issues relative to groundwater withdrawals.

Be it Enacted by the Senate and House of Representatives in General Court convened:

31:1 Commission to Study Issues Relative to Groundwater Withdrawals; Duties Expanded. Amend 2003, 305:3 as amended by 2008, 176:1 to read as follows:

305:3 Duties.

I. The commission shall***:***

(a) Study ways to bring a balanced approach to water use among residential, public water supply, industrial, commercial, agricultural, energy, recreational, and other water users, and to improve the current process by which new water users may reasonably and efficiently use state water resources, including consideration of potential regional impacts and local water management issues, in order to best protect and preserve an adequate supply of water for the state with particular attention to groundwater. This study shall include consideration of issues such as potential impacts on New Hampshire's environment, property rights as they relate to groundwater, possible fees on water withdrawals, and the protection of New Hampshire's aquifers. [~~The commission shall also~~]

(b) Study criteria, including public benefit, for the granting of large water withdrawals other than those of RSA 485-C and RSA 485-A. Consideration of this issue shall include appropriate roles for municipalities in the permitting and regulation of large groundwater withdrawals and include input from municipalities and other appropriate entities. [~~The committee shall~~]

(c) Study the amount of financial responsibility the person seeking approval for a large commercial groundwater withdrawal would be required to demonstrate, including bonding and insurance. In determining such amount, the commission shall consider potential damage to the environment and nearby wells, including but not limited to, unreasonable reductions in well capacity or contaminant migration from off-site contamination sources which impact water quality.

(d) Design an appropriate statewide monitoring plan to ensure long term sustainability of groundwater resources and participation in the development and distribution of public educational materials on the municipal role in large groundwater permitting, including local and state regulations.

II. The commission may address other issues related to water.

31:2 Effective Date. This act shall take effect upon its passage.

Approved: May 18, 2010

Effective Date: May 18, 2010

Attachment B

LARGE GROUNDWATER WITHDRAWAL PERMITTING

Large Groundwater Withdrawal Permitting

1.	Identify and review how other states permit large groundwater withdrawals	**Completed** - This information has been extensively researched and summarized in tabular, narrative and graphical form by the commission. NH laws and regulation pertaining to groundwater withdrawals are among the most stringent in the among eastern water law states.
2.	Are any changes to the existing large groundwater withdrawal permitting program needed? Why and what should they be?	**Yes** - Provisions in law should be added to clarify that withdrawals from replacement wells (a new well installed to replace or back-up an existing well that operates and impacts water users and water resources in substantially the same manner as the well that is being replaced) do not require a new large groundwater withdrawal permit. **Legislation (HB 458) was passed in 2007 that addresses this issue.**
3.	Should there be additional requirements for commercial applicants under the large groundwater permitting program? If so, who should be subject to them and what should they be?	**No** - There is no technical basis for this requirement. Developing additional regulatory requirements for certain types of water users, such as bottled water is discriminatory in nature. SB 386 of 2006 states that NHDES can modify a large groundwater withdrawal permit if it is necessary to protect the water supply for the public. Another commission subcommittee will be studying the issue of a water user hierarchy.
4.	Is the role of local government in the permitting process adequate? If not, why and how should it be changed?	**Yes** - NH requires two public hearings, two written public comment periods, that copies of all documents be provided to municipalities, and that municipalities have intervener status during the permitting process. The role of local government in the permitting process is more extensive than other states. Many of these requirements were added to state law in 2005 and 2006. The subcommittee acknowledged that groundwater is a shared resource and needs to be managed on a watershed basis. Therefore, the subcommittee noted that it is appropriate that the state have jurisdiction to regulate groundwater. State jurisdiction to regulate groundwater is also consistent with all other states operating under an eastern water law system. This issue was re-evaluated pursuant to House Bill 1353 of 2008 and was reported on to the Legislature in November 2010.
5.	Should local permitting (e.g. site plan review) be obtained prior to a State large groundwater withdrawal permit application being reviewed?	**No** - Both the subcommittee and the legislature have assessed this issue and do not think a provision of this nature is warranted. Many local governments prefer to have the state permitting process occur first or in tandem with the local permitting process. In this manner, the local planning board can integrate its findings and decisions made for a project with state findings and decisions on permit applications.

6.	Does there need to be a requirement to project and protect future water needs and supply when permitting a new large groundwater withdrawal? If so, how should future need be determined?	House Bill 1609 of 2006 requires NHDES to develop, on a pilot basis, a regional groundwater management plan that estimates available water supply and projects future needs. This report was submitted to the Legislature in November 2010.
7.	Should an applicant have to demonstrate that a proposed large withdrawal is protective of public interest?	**Yes** - NH currently ensures the public interest is protected when new large groundwater withdrawals are proposed. NH law does stipulate criteria for protecting water supplies and water resources. Senate Bill 386 of 2006 identifies quantitative and qualitative criteria for determining if ecological resources or water supplies will be adversely impacted by a proposed new large groundwater withdrawal. A general requirement of stipulating protection of "public interest" would have little meaning and be subjective without clearly defining what "public interest" means. Any definition would likely produce criteria for protecting water supply and water resources that is similar to the criteria already in law. In some states, where protection of "public interest" is included in law, but not defined, boards of elected or appointed officials make determinations on proposed water withdrawals. The subcommittee agreed that technical decisions on water supply projects are more appropriate for regulating water.
8.	Should there be additional requirements when developing withdrawals that that will result in an inter-basin transfer of water? If so, what criteria should be used to determine which withdrawals should be subject to more scrutiny (e.g. basin size, withdrawal volume, etc.)	**No** - The subcommittee found that the existing large groundwater withdrawal permitting process factors into the permitting process the significant displacement of large volumes of water from a watershed or aquifer.

9.	Should “grandfathered” large groundwater withdrawals be subject to regulation or withdrawal limitations?	**Additional regulation should not be required at this time** - The subcommittee defined "grandfathered" large withdrawals as a withdrawal from any well that was developed prior to August 1998 that either does or has the capacity to exceed 57,600 gallons over any 24-hour period. There is no definition for "grandfathered" large withdrawals in state law. The subcommittee noted that developing a permitting process for grandfathered large groundwater withdrawals has been previously voted down by the legislature. It also noted that while grandfathered large withdrawals do not have to obtain a permit, these withdrawals are subject to the State's surface water quality standard which protect the quality and quantity of all surface waters in the state. The subcommittee also noted that grandfathered large withdrawals are subject to the common law of the state, and that unreasonable impacts by a large withdrawal could be mitigated through a judicial process. The subcommittee researched the topic of grandfathered large groundwater withdrawals thoroughly. It found that: 1) 85% of grandfathered large withdrawals are associated with community water supplies; and 2) Only one occurrence of an unmitigated adverse impact caused by a large groundwater withdrawal has been documented. The subcommittee considered the range of options for managing impacts associated with grandfathered large withdrawals and determined that no changes are warranted at this time. The subcommittee prepared legislation that establishes a process for resolving conflicts if a grandfathered large withdrawal affects private water supply wells. Based on the research of the subcommittee, however, it does not support moving forward with the legislation at this time. Nevertheless, if unacceptable impacts to private water supply wells from withdrawals from grandfathered wells become an issue in the future, then the subcommittee recommends consideration of the conflict resolution legislation that it is has prepared. The language associated with the conflict resolution process is included at the end of this appendix.

10.	What are the loopholes in the current large groundwater withdrawal permitting law and regulations?	SB 386 of 2006 addressed the issues of groundwater withdrawals from multiple wells at the same property. Other loopholes that remain include: 1) Groundwater fed dug ponds not being subject to groundwater withdrawal permitting; 2) Unused wells developed prior to 1998 not being subject to the large withdrawal permitting process; and 3) Subdivision housing developments installing hundreds of private wells to avoid large withdrawal permitting. The subcommittee noted that housing developments installing hundreds of private wells for new homes at least would require a large area of land, and that often much of the water is returned on-site via individual septic systems. The subcommittee also noted that NHDES had developed policies to address the issue of unused wells developed prior to 1998, and that these policies have been effective to date. Lastly, the subcommittee did not believe that groundwater withdrawals from dug ponds would be common-place and warrant extensive regulation to prevent regional impacts from occurring. The subcommittee noted that often, dug ponds store stormwater run-off or surface water skimmed from a nearby river during high flows.
11.	Should the amount of land owned by an applicant be considered as criteria when permitting new large groundwater withdrawals?	**No, not directly** - Under the current permitting process, this issue is indirectly considered. A person proposing a large withdrawal that owns a lot of land would most likely have to address a lower number of environmental impacts. This is because a large number of other water users would not likely be located nearby, and there would be a lower number of other competing water users within the watershed and aquifer. The concept of linking a large withdrawal to the amount of land owned has been considered by the legislature multiple times over the last few years. The legislature has not supported this concept. In general, issues with zoning/sprawl, impractical land ownership requirements and identifying the technical or scientific rationale for doing this have been reasons for legislative committees to decline supporting this concept. The subcommittee noted that directly relating state regulation of groundwater withdrawals to the amount of land owned is not consistent with historical eastern water law concepts.

12.	Are the rights of future users adequately addressed in the current system? If not, how could future rights be better accommodated?	**Yes** - The subcommittee found that current law requires that NHDES modify large withdrawal permits if necessary to protect public water supplies and environmental resources. Also, existing regulations require that large groundwater withdrawal permits be renewed every ten years, and that a thorough assessment of potential impacts associated with a large groundwater withdrawal occur at that time. The subcommittee also found that NHDES already builds into its existing permits, measures to protect future water needs in areas where significant development is planned. Additionally, HB 1609 requires NHDES to conduct a pilot study to assess approaches to quantify water availability and predict future water needs. House Bill 1609 also requires that a groundwater management plan be developed.
13.	Are surrounding wells and water resources (and the ecosystems dependent upon them) adequately protected by the existing law? If not, what impact criteria should be used instead?	**Yes** - New Hampshire's requirements are working well and exceed that of other states. No new issues could be identified.
14.	Do towns need authority to impose water use restrictions for private wells during times of drought or other water supply emergencies?	**Yes** - The majority of the subcommittee found that municipalities do not have adequate authority to restrict discretionary outdoor uses of groundwater during times of drought. The subcommittee has proposed legislation that would allow municipalities to adopt ordinances or bylaws to restrict residential lawn watering when the state or federal government have declared a stage of drought. The member of the commission representing the NH Farm Bureau has stated that this organization does not support the proposed legislation. The NH Farm Bureau believes this legislation may unfairly impact the business of sod farmers. **(Note Legislation (HB 457) passed in 2007 that addresses this issue)**
15.	Other Issues - Well Tagging	While completing its work, the subcommittee found implementing a requirement for well tagging in NH is important for: 1) Keeping records of wells installed in NH; 2) Completing water resource studies; 3) Ensuring wells are properly maintained or decommissioned; 4) Accurately geo-locating wells; and 5) Completing water quality studies and notification. The commission found it very difficult to cross link wells in various databases, because wells are not tagged with a common unique identification number. **House Bill 459 passed in 2007 to require that well construction reports include additional information to more easily be able to match wells with well records. Well tagging was not a requirement of this legislation, however.**

Withdrawals from Wells Sited Prior to August 1998 Subcommittee
May 3, 2010

The Subcommittee recommends that the Commission conduct a vote to support Option 1 or 2, below:

Option 1: Support the recommendation of the Issue 1 Subcommittee in 2006 which stated:

"Additional regulation should not be required at this time - The subcommittee defined "grandfathered" large withdrawals as a withdrawal from any well that was developed prior to August 1998 that either does or has the capacity to exceed 57,600 gallons over any 24-hour period. There is no definition for "grandfathered" large withdrawals in state law.

The subcommittee noted that developing a permitting process for grandfathered large groundwater withdrawals has been previously voted down by the legislature. It also noted that while grandfathered large withdrawals do not have to obtain a permit, these withdrawals are subject to the State's surface water quality standard which protect the quality and quantity of all surface waters in the state. The subcommittee also noted that grandfathered large withdrawals are subject to the common law of the state, and that unreasonable impacts by a large withdrawal could be mitigated through a judicial process.

The subcommittee researched the topic of grandfathered large groundwater withdrawals thoroughly. It found that: 1) 85% of grandfathered large withdrawals are associated with community water supplies; and 2) Only one occurrence of an unmitigated adverse impact caused by a large groundwater withdrawal has been documented.

The subcommittee considered the range of options for managing impacts associated with grandfathered large withdrawals and determined that no changes are warranted at this time. The subcommittee prepared legislation that establishes a process for resolving conflicts if a grandfathered large withdrawal affects private water supply wells. Based on the research of the subcommittee, however, it does not support moving forward with the legislation at this time. Nevertheless, if unacceptable impacts to private water supply wells from withdrawals from grandfathered wells become an issue in the future, then the subcommittee recommends consideration of the conflict resolution legislation that is has prepared"

Option 2: Support amendments to RSA 485-C that enable private well owners to enter into a conflict resolution process if a withdrawal from a well sited prior to August 1998 increases water use and may be causing an unmitigated adverse impact to a domestic well.

"Grandfathered Large Groundwater Withdrawal" means a groundwater withdrawal at a single property or place of business that exceeds 57,600 gallons over any 24-hour period that is exempt from requiring a withdrawal permit under RSA 485-C:4 or RSA 485-C:21.

I. The department shall adopt rules, pursuant to RSA 541-A, to require that potential adverse impacts to private domestic wells caused by a grandfathered large groundwater withdrawal that increases its maximum 24-hour or average 24-hour withdrawal volume by more than 57,600 gallons the more than the withdrawal volume utilized prior to January 1, 2010 be investigated and mitigated. These rules shall strike a reasonable balance between the responsibility and obligations of an owner of a domestic well, an owner of a grandfathered large groundwater withdrawal, and the NHDES to provide and collect data to assess the potential for an occurrence of an adverse impact. Such rules shall include:

(a) Criteria and procedures for making a report of a potential adverse impact to a domestic well;

(b) Procedures to be followed by the NHDES when investigating the validity of a potential adverse impact to a domestic well;

(c)Requirements for the owner of the large groundwater withdrawal to conduct additional studies when necessary to determine the status of a potential adverse impact.

(d) Procedures by which the department may require an owner of a grandfathered large groundwater withdrawal to mitigate a confirmed adverse impact, as provided by department rules, at no initial capital cost to persons whose wells are adversely affected by the withdrawal or order reduced withdrawals.

II This section shall not be construed to abrogate common law or other statutes of this state affecting water use or water withdrawals.

Attachment C

Groundwater Quantity Law Subcommittee Final Report

Date: June 15, 2007 (adopted with edits by the Groundwater Commission)

To: Groundwater Commission (SB155, Ch. 305:1, 2003 & SB142, Ch. 287, 005)

From: Glen Greenwood, Chair of Issue 2: Groundwater Quantity Law Subcommittee

Subject: Issue 2: Groundwater Quantity Law Subcommittee Final Report

This report documents the activities and findings of the Issue 2: Groundwater Quantity Law Subcommittee.

This subcommittee was chaired by Glen Greenwood. Subcommittee members included:

Representative Judith Spang
Representative Cooney (no longer a member)
Representative Tom Fargo
Jim Griswold
Michelle Hamm
Brian Goetz
DES Representatives (Pillsbury, Kernen, Roy)

The full Groundwater Commission began consideration of Issue 2: Groundwater Quantity Law at the May 22, 2006 meeting. At this meeting, three attorneys were asked to give their views on the current laws governing large groundwater withdrawals. Minutes from this meeting are attached. This information was used by the subcommittee to refine topics for consideration.

The Issue 2: Groundwater Quantity Law Subcommittee met on five occasions.

The first subcommittee meeting was held on May 13, 2006. It was poorly attended. A small group discussed the option of seeking an advisory opinion from the Supreme Court on if groundwater is part of the public trust. They also brainstormed various questions and topics for the subcommittee to consider.

At the second meeting on July 10, 2006, Glen Greenwood was elected chair. After considering a variety of topics related to water quantity law, the subcommittee agreed to focus on two areas:

1. Is it important to further clarify that groundwater is part of the Public Trust Doctrine and, if so, how is that best achieved?
2. Is there a risk to NH related to allowing the commercial use of groundwater in products that are sold in countries that the US is in an international trade agreement with?

There was also general discussion regarding eastern water law which is based on the "reasonable use" standard as opposed to western water law which is based on "prior appropriation".

The remaining meetings (October 10, 2006, November 11, 2006 and March 5, 2007) were spent considering and discussing the two focus areas described above. The following describes the issue and the actions the subcommittee recommends be taken in relation to them:

Focus Area I - Is it important to further clarify that groundwater is part of the Public Trust Doctrine and, if so, how is that best achieved?

To approach this question, several attorneys had been asked to provide testimony to the full Commission. The subcommittee reviewed the testimony of the three attorneys contained in the attached minutes and looked at existing statutes that describes groundwater as part of or in relation to the public trust (e.g. 481:1 and 485-C (as revised 2006)). The subcommittee also reviewed the recent NH Supreme Court opinion concerning USA Springs.

The subcommittee also considered the idea of requesting an opinion of the Supreme Court as to whether groundwater is part of the public trust. To pursue this idea the subcommittee developed a number of questions regarding the need for a Supreme Court opinion, with hope of having a number of different attorneys (representing different interests) respond to them. However, only two responses were received. One from Mike Walls, DES Assistant Commissioner, who believes it is not necessary to ask for an opinion and that groundwater is protected in various parts of existing statutes as though part of the public trust. The other response was from Jennifer Patterson, from the Attorney Generals' Office, Department of Justice, who explained why the DOJ was unable to respond to the specific questions and who provided information about the circumstances in which the court would entertain such a request.

Based on the information reviewed, the subcommittee concluded that groundwater was in fact protected as though it were part of the public trust both by statute and under common (court/judge made) law. Accordingly, they determined it is unnecessary to take any further action, in order to protect groundwater, for the benefit of the public. Key information used in making this determination includes:

<u>Important Statutory language in 485-C and 481:1:</u>

485-C:1 Statement of Purpose. –

I. The purpose of this chapter is to protect the natural quality of the groundwater resource of the state by assisting local groundwater protection efforts and by establishing procedures and standards for the classification and remediation of groundwater. The legislature recognizes the fundamental importance of the groundwater resource and the role of local planning and management in groundwater protection, and intends through this legislation to provide a framework for local

groundwater protection. The legislature also intends to provide for consistent, protective management and remediation of groundwater affected by regulated contaminants. The natural quality of the groundwater resource shall be preserved and protected in order that groundwater may be used for drinking water supply. Ambient groundwater quality standards shall meet drinking water standards, and the classification of groundwater shall provide opportunity for protecting groundwater of high value as a drinking water supply. The legislature recognizes that groundwater constitutes an integral part of the hydrologic cycle and that the protection of groundwater quality is necessary to preserve the integrity of surface water.

II. The legislature finds that the most effective means of preserving the existing high quality of groundwater is by identification and careful management of operations or activities which may cause contamination of groundwater if not properly conducted. Because groundwater is primarily a local resource, cities and towns should have the first opportunity to institute programs for groundwater protection within the scope of this chapter. Suppliers of water should also have this opportunity because of their vital interest in preserving the quality of their groundwater supply. The state, which has general responsibility for groundwater management in the public trust and interest, should develop groundwater protection programs within the scope of this chapter when such programs are not developed by a local entity.

485-C:3 Duties of the Department. – The department shall:

I. Maintain a …

VI. Manage and preserve the state's groundwater on behalf of the citizens of the state, recognizing that any private use of groundwater and other public waters shall be reasonable in light of the protected interests of the general public in the use and enjoyment of groundwater and other public waters by ensuring that no unmitigated adverse impact, as defined in this chapter, occurs.

485-C:21 Approval for Large Groundwater Withdrawals. –

I. No person may withdraw …

V-c. In order to preserve the public trust, no large groundwater withdrawal shall cause an unmitigated impact as determined by the following:

(a) Reducing the ....

VIII. Before the department issues a large groundwater withdrawal permit, any municipality in which a well is sited or proposed to be sited, or any municipality within the potential impact area of the proposed withdrawal pursuant to paragraph V-e, may require the department to determine that the withdrawal will not infringe on the public's use of groundwater, including any contribution to wetlands and surface waters, by ensuring that the requirements of paragraph V-c are met. The department's determination shall be based on substantial evidence and shall include the methods, evidence, and data it used to support its judgment.

481:1 Declaration of Policy. – The general court finds that an adequate supply of water is indispensable to the health, welfare and safety of the people of the state and

is essential to the balance of the natural environment of the state. Further, the water resources of the state are subject to an ever-increasing demand for new and competing uses. The general court declares and determines that the water of New Hampshire whether located above or below ground constitutes a limited and, therefore, precious and invaluable public resource which should be protected, conserved and managed in the interest of present and future generations. The state as trustee of this resource for the public benefit declares that it has the authority and responsibility to provide careful stewardship over all the waters lying within its boundaries. The maximum public benefit shall be sought, including the assurance of health and safety, the enhancement of ecological and aesthetic values, and the overall economic, recreational and social well-being of the people of the state. All levels of government within the state, all departments, agencies, boards and commissions, and all other entities, public or private, having authority over the use, disposition or diversion of water resources, or over the use of the land overlying, or adjacent to, the water resources of the state, shall comply with this policy and with the state's comprehensive plan and program for water resources management and protection.

Important Court Decisions

Although the courts have not specifically stated that groundwater is part of the public trust, they have also not stated it is not part of the public trust. In both the USA Springs decision and in other decisions referenced in the attached minutes that contain the three attorney's views, the courts have acknowledged the states authority to protect groundwater for the health and well being of the public. It is also clear that the state has very strong authority under "police powers" to regulate and protect groundwater resources.

The following excerpt from Attorney Beliveau's views contained in the attached minutes references a number of cases which supports that the courts do not view groundwater as a private property right, but rather as being subject to the "reasonable use" standard.

"*Attorney Beliveau then addressed the issue of takings/private ownership of groundwater and noted that there are different opinions regarding the issue of takings relative to groundwater laws and regulations. He noted that some believe the common law and public trust doctrine allow for the state to regulate groundwater, while others cite the constitution and property rights. He noted that on page 7 of the USA Springs decision, the Supreme Court decision sheds significant light on the issue. He explained that plaintiffs in the USA Springs case petitioned the court for a takings claim because USA Springs would lower the water level/pressure in their wells - essentially taking or damaging their property (the water beneath their land). Attorney Beliveau explained that the Supreme Court said that you do not have a property right in the water underlying you land and they cited the Bassett case in 1862 which described the regulation of groundwater as being subject to the reasonable use standard and that there is no absolute ownership of groundwater. Attorney Beliveau continued to explain that in*

addition to citing the Bassett case, the Supreme Court cited a 1979 Florida Supreme Court case which stated (see page 8 of the USA Springs decision):

"The right to use water does not carry with it ownership of the water lying under the land. This "right of user" may be protected by injunction, or regulated by law, but the right of user is not considered "private property" requiring condemnation proceedings unless the property has been rendered useless for certain purposes."

Attorney Beliveau explained that in the USA Springs decision, the NH Supreme Court went on to further cite additional court cases demonstrating that groundwater is not owned, and he noted that in addition to the 1862 Basset case and 1979 Florida Supreme Court case, they cited a 1998 Ohio case which stated:

"The loss of the use of groundwater is not a loss of the use or enjoyment of the overlying land. In this case, plaintiffs' complaint, alleging only a deprivation of the flow of groundwater did not state a claim for compensation."

Attorney Beliveau explained that he thinks what the NH Supreme Court said in the USA Springs decision provides a lot of insight on the issue of private property rights and the question of if groundwater is part of the public trust/"who owns the groundwater" in New Hampshire."

Focus Area II - Is there a risk to NH related to allowing the commercial use of groundwater in products that are sold in countries that the US is in an international trade agreement with?

There is ongoing concern that if a groundwater withdrawal permit is issued for a withdrawal for a product (e.g. bottled water) and that product is sold to a country that the United States is in a trade agreement with (e.g. North American Trade Agreement, World Trade Organization Agreements, etc), the governing bodies for these agreements could preclude the imposition of production restrictions by the state either outright or without compensation from the state.

The subcommittee considered existing information that DES had in its files including letters and articles from concerned parties. The committee also invited Save Our Groundwater to provide additional information for the subcommittee to consider. In addition, the subcommittee reviewed an informal opinion by the Department of Justice prepared in April, 2002. A list of all material considered by the subcommittee is attached. The general impression of the subcommittee is that:

1. This issue is far broader than water withdrawal regulation and would apply to all resources used in manufacturing products that are sold in countries subject to trade agreement requirements, and;
2. While there is always uncertainty on how a group of international judges will decide any case brought before them, actions to date suggest that as long as there are clear environmental protection regulations and they are consistently applied,

there is not a substantial risk that protection would be limited or compensation required by international trade agreement requirements.

Because these agreements are new and evolving, there continues to be concerns about this issue, the subcommittee recommends that the Groundwater Commission request the Department of Justice to issue another opinion on what risk the state incurs in regulating the use of our natural resources for manufacturing products with the potential to be sold to countries that the US has trade agreements with.

Attachment D

Hierarchy of Groundwater Users

Report of Issue 3 Subcommittee - Hierarchy of Groundwater Users

"APPROACHES FOR DETERMINING GROUNDWATER PRIORITIES DURING A WATER SUPPLY SHORTAGE"

The work plan for the **SB 155 – Commission to study issues relative to groundwater withdrawals (Commission),** dated November 2005, requires a Subcommittee of the Commission to study the concept of developing a Hierarchy of Groundwater Users in New Hampshire.

The Commission's work plan specifically requires that the Subcommittee consider the following:

1) Identify and review the purpose and structure of other states' water use hierarchies;

2) Review the existing Drought Management Plan to determine if it establishes an appropriate hierarchy in times of temporary scarcity/drought; and

3) Determine if there is a need for a hierarchy of groundwater users for any other purposes (e.g. reserving available water for specific uses in permitting decisions etc?) If so, what should it be and how should it be applied?

The results of the work of the Subcommittee on these three issues are summarized in this report.

The Subcommittee presented its report to the full Commission on August 21, 2008. At this meeting, Commission members recommended that the report be amended to include the following:

1) Actions that Can be Taken By a Water User to Be Prepared to Mitigate the Effect of Water Shortages; and

2) Data Needs to Implement a Hierarchy of Water Users During a Water Supply Shortage.

The Subcommittee developed this information in response to the Commission's request and presented it to the Commission on November 12, 2008. This information is now attached to this report as Attachments 1 and 2 respectively.

The Commission also recommended that the subcommittee include a goal statement for the potential approaches to establishing a water use hierarchy that are discussed on pages 11-15 of this report. A goal and limitation statement is included in bold italics on page 11 of this report in response to the recommendation of the Commission.

Item 1: Identify and review the purpose and structure of other states' water use hierarchies

In May 2006, the New Hampshire Department of Environmental Services (NHDES) researched the laws and regulations of other states that manage groundwater under the common law reasonable use doctrine (eastern water law) to assess if and how water use hierarchies have been

developed and implemented in these jurisdictions. A document titled "Summary of States with Groundwater Use Priorities Specifically Described in Law" dated May 2006 provides the text of statutes and regulations that pertain to water use priorities that could be identified by NHDES for other eastern water law states. This document is included as Attachment 3 to this document.

While states may have established written statutes or regulations describing water use hierarchies, these written laws may run parallel to, be affected by and in some cases be superseded by common law (law that is based on historic court decisions opposed to written codified law) which establish: 1) The doctrine of reasonable use for eastern water law states; 2) The Public Trust Doctrine; and 3) Police powers of states to protect public welfare. This document does not assess the potential implications of enacting statutes and regulations that establish a hierarchy of water uses relative to what it means to common law. In general, a hierarchy of water uses that is justifiable based on sound technical data, applied in a nondiscriminatory manner, and that is necessary to protect the public water resources and welfare is probably consistent with the spirit of existing common law. Actual application of these ideals may be subject to legal interpretation and require analysis on a case by case basis from legal experts or the judicial system.

The water use hierarchies established by other states are arranged around two different priority concepts. First, water use hierarchies are established and applied by some states to all water uses when there are competing water uses and a water supply shortage. These "water shortage" hierarchies generally establish a water use category priority list or identifies interests or objectives that should be preferentially protected should a shortage occur. Second, some states establish a hierarchy of water use in statutes or regulations that ensure new water users do not adversely impact existing water users, regardless of the type of water use. This provision essentially gives water users that predate water withdrawal regulations a priority over new users under statutory law. Although statutory law may include provisions whereby new users cannot adversely impact existing users, new users may be able to take court action citing their common law right to reasonably use groundwater beneath land they own.

Figure 1 identifies states that have established water use priorities that identify water use categories or attributes associated with a particular water use that are to be preferentially protected if there is a water supply shortage. Figure 2 identifies states that have established requirements that ensure existing water uses are protected from new water uses irregardless of the type of existing or proposed water use. Figure 3 identifies states that have not established water use hierarchies. Table 1 provides a summary of the statutory or regulatory language associated with each eastern water law state that seems to have developed a water use hierarchy to some extent. Attachment 3 of this document provides excerpts of state law and regulation from other eastern water law states that pertains to water use priorities.

Table 1: Summary of Water Use Priorities in Eastern Water Law States

State	Statutory or Regulatory Provisions that Establish Water Use Priorities
New Hampshire	New large groundwater withdrawals that exceed 57,600 gallons/24-hour period may not adversely impact existing or new water users or water resources unless mitigation is provided. Permits for large withdrawals from wells that were sited after July 1998 must be modified if necessary to protect public water supply.
Alabama	Human consumption is considered the highest priority water use.
Arkansas	In the issuance of groundwater rights, the reasonable preference is given first to sustaining life, then to maintaining health, and finally to increasing wealth. Groundwater use for bottled water marketers and public water supplies also cannot be restricted by state law.
Connecticut	Connecticut does not prioritize the use of water. The commissioner may suspend or limit water use during water shortages.
Delaware	Permit applicants must demonstrate that proposed uses will not interfere with existing uses. Permit applicants may be required to supply water to existing users affected by proposed allocation.
Florida	Permit applicants must demonstrate that proposed uses will not interfere with existing uses. Groundwater permitting authority in Florida is administrated jointly by the State and Regional Water Management Districts. Regional Water Management Districts classify permits, and during drought, restrict water uses consistent with the following permit classifications: (1) Indoor Uses; 2) Essential Uses, including a subclassification for Water Utility Use; 3) Commercial and Industrial Uses; 4) Agricultural Uses; 5) Landscape Uses is further classified (see Attachment 3)
Georgia	Georgia has developed a water use classification system. "Older" established water use and farm water use are given preference. In the event of a water shortage, human consumption is given first priority and farm water use is given second priority.
Illinois	Illinois state law gives preference to the domestic use of water.

Table 1: Summary of Water Use Priorities in Eastern Water Law States

State	Statutory or Regulatory Provisions that Establish Water Use Priorities
Indiana	Owners of small capacity water wells are protected against the impacts of high capacity ground-water pumpage if it substantially lowers water levels, resulting in the failure of a small capacity well. A high capacity well (significant ground water withdrawal facility) is defined in the statute as "the ground water withdrawal facility of a person that, in the aggregate from all sources and by all methods, has the capability of withdrawing at least one hundred thousand (100,000) gallons of ground water in one (1) day". A small capacity well (nonsignificant ground water withdrawal facility) has less than 100,000 gallon-per-day pumping capability.
Iowa	Iowa has developed a hierarchy of water uses when there is a shortage. Water use priorities are listed below from lowest priority to highest priority: a. Water conveyed across state boundaries. b. Uses of water primarily for recreational or aesthetic purposes. c. Uses of water for the irrigation of hay, corn, soybeans, oats, grain sorghum or wheat. d. Uses of water for the irrigation of crops other than hay, corn, soybeans, oats, grain sorghum or wheat. e. Uses of water for manufacturing or other industrial processes. f. Uses of water for generation of electrical power for public consumption. g. Uses of water for livestock production. h. Uses of water for human consumption and sanitation supplied by rural water districts, municipal water systems, or other public water supplies as defined in section 455B.171. i. Uses of water for human consumption and sanitation supplied by a private water supply as defined in section 455B.171.

Table 1: Summary of Water Use Priorities in Eastern Water Law States

State	Statutory or Regulatory Provisions that Establish Water Use Priorities
Kentucky	Kentucky requires that entities withdrawing more than 10,000 gallons per day obtain a water withdrawal permit. The permit may restrict water usage to protect the environmental or other water users. However, Kentucky exempts the following water users from the obligation to obtain a water withdrawal permit - essentially establishing these as priority water uses: 1) Water used for domestic purposes (needs for one household); 2) Water used for agriculture; 3) Water used in the production of electricity by steam generating plants of companies whose retail rates are regulated by the Kentucky Public Service Commission or for which facilities a certificate of environmental compatibility from such commission is required by law; or 4) Water used for injection underground in conjunction with operations for the production of oil and gas.
Maine	Maine has established statutory preference for protecting beneficial domestic uses of water.
Maryland	During a water emergency, preference is given to (1) domestic and municipal uses; (2) agriculture uses; and (3) other uses. Also, new withdrawals may not impact existing withdrawals.
Massachusetts	Preference is based on the use of a water withdrawal, date a water use was established and availability of requested quantity in a river basin.
Michigan	None identified

Table 1: Summary of Water Use Priorities in Eastern Water Law States

State	Statutory or Regulatory Provisions that Establish Water Use Priorities
Minnesota	1) First priority, domestic water supply, excluding industrial and commercial uses of municipal water supply, and use for power production; 2) Second priority, a use of water that involves consumption of less than 10,000 gallons of water per day; 3) Third priority, agricultural irrigation, and processing of agricultural products involving consumption in excess of 10,000 gallons per day; 4) Fourth priority, power production in excess of the use provided for in the contingency plan developed under section 103G.285, subdivision 6; 5) Fifth priority, uses, other than agricultural irrigation, processing of agricultural products, and power production, involving consumption in excess of 10,000 gallons per day; and 6) Sixth priority, nonessential uses. Grandfathered water users with a higher water use priority is protected from impacts associated with new uses of water.
Mississippi	1. Public Supply [including municipal supplies, rural water systems, private water systems, private wells, and institutional uses (such as schools, churches, and military bases)] 2. Industrial/Commercial (Including Agricultural and Commercial Livestock Uses) 3. Enhancement of Wildlife Habitat and Other Recreational Uses 4. Other Uses
Missouri	None identified
New Jersey	A hierarchy has not been developed, but the Commissioner has authority to develop one if a water supply shortage exists.
New York	None identified
North Carolina	None identified
Ohio	None identified
Pennsylvania	None identified

Table 1: Summary of Water Use Priorities in Eastern Water Law States

State	Statutory or Regulatory Provisions that Establish Water Use Priorities
Rhode Island	Rhode Island currently prioritizes agriculture water use. However, a Subcommittee has developed a white paper that proposes enhancements to the state's water use prioritization system
Tennessee	None identified
Wisconsin	None identified
Vermont	None identified

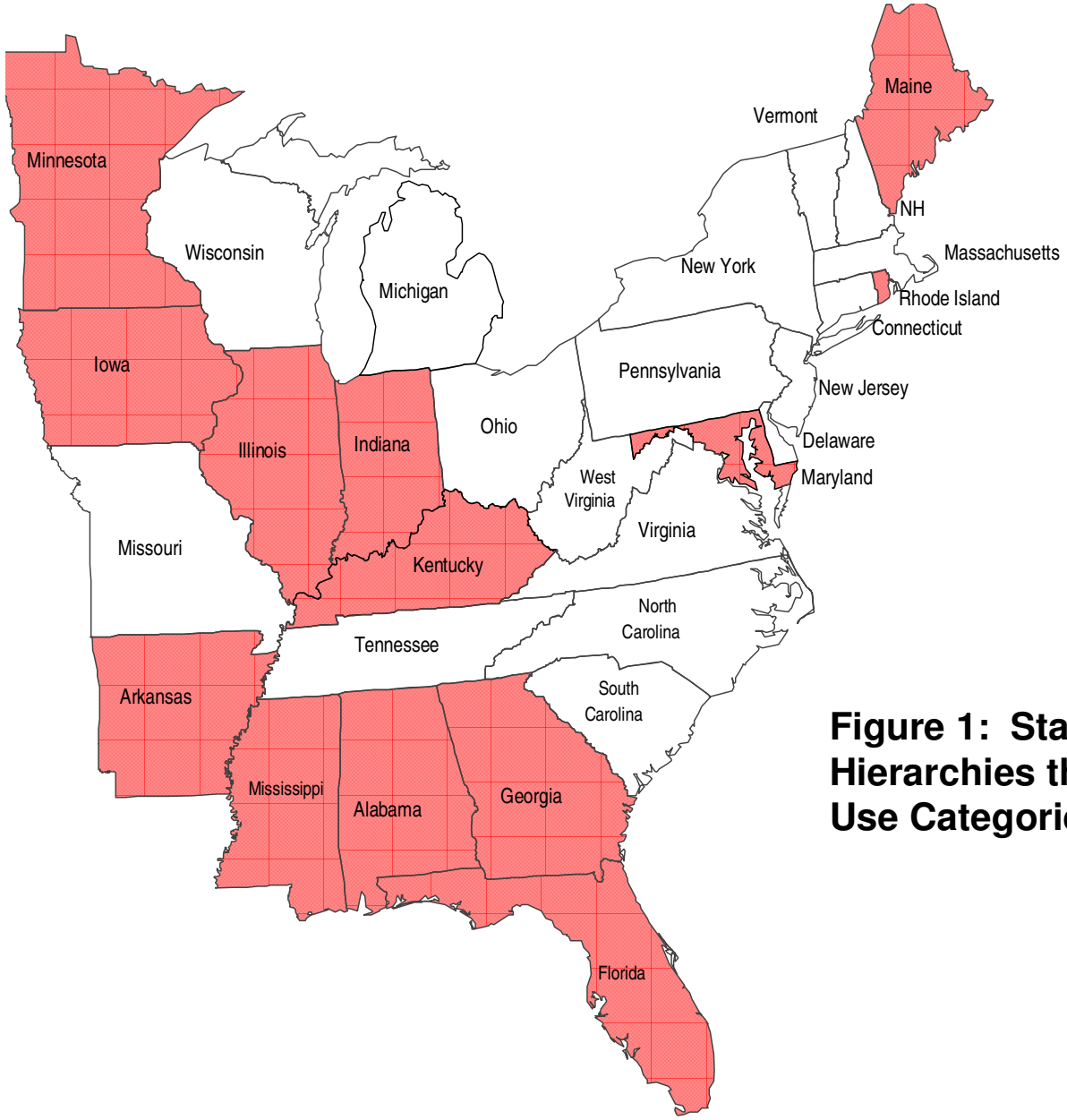

Figure 1: States with Water Use Hierarchies that Prioritize Water Use Categories or Attributes

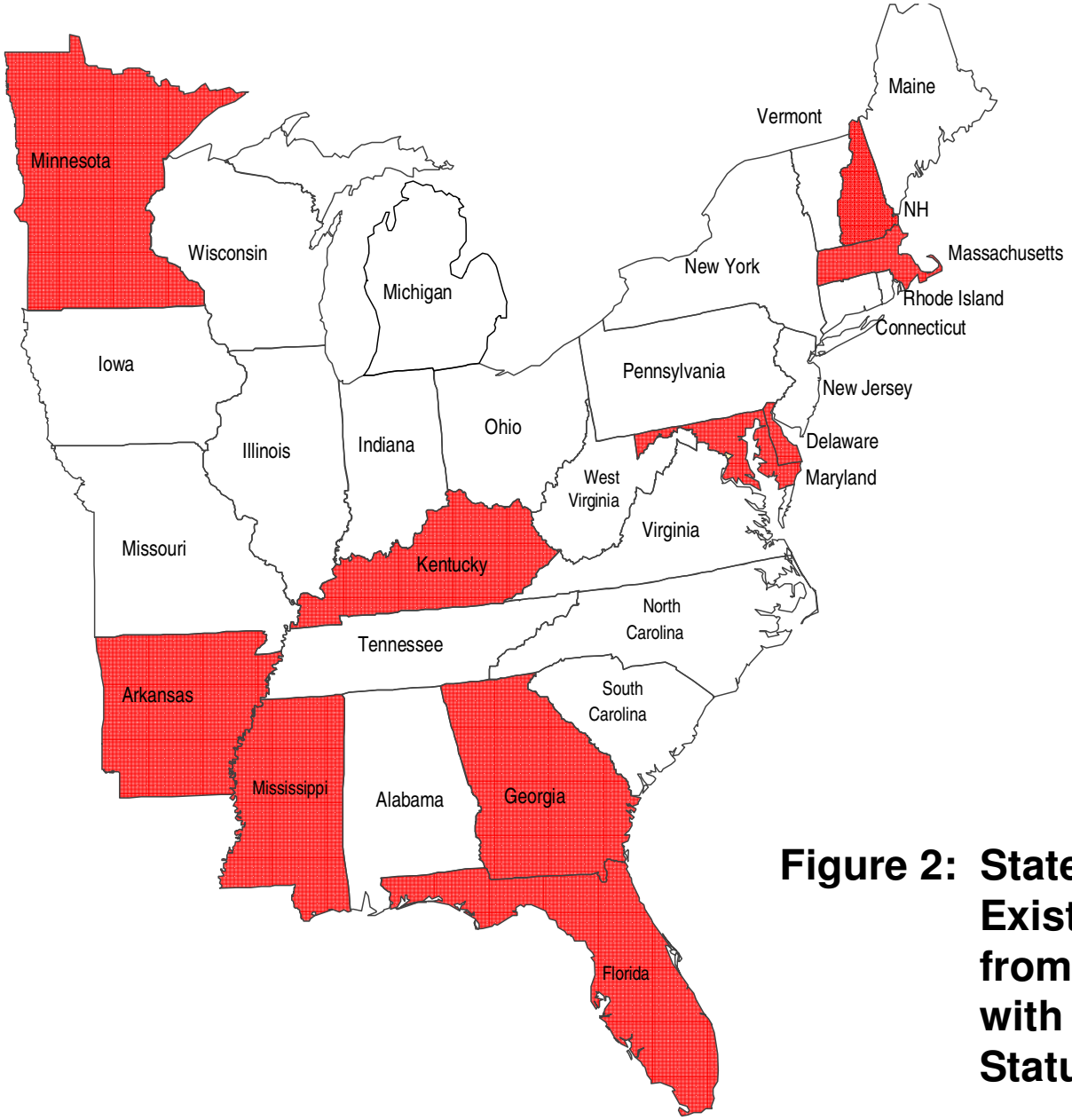

Figure 2: States that Protect Existing Water Uses from Impacts Associated with New Water Uses in Statutory Law

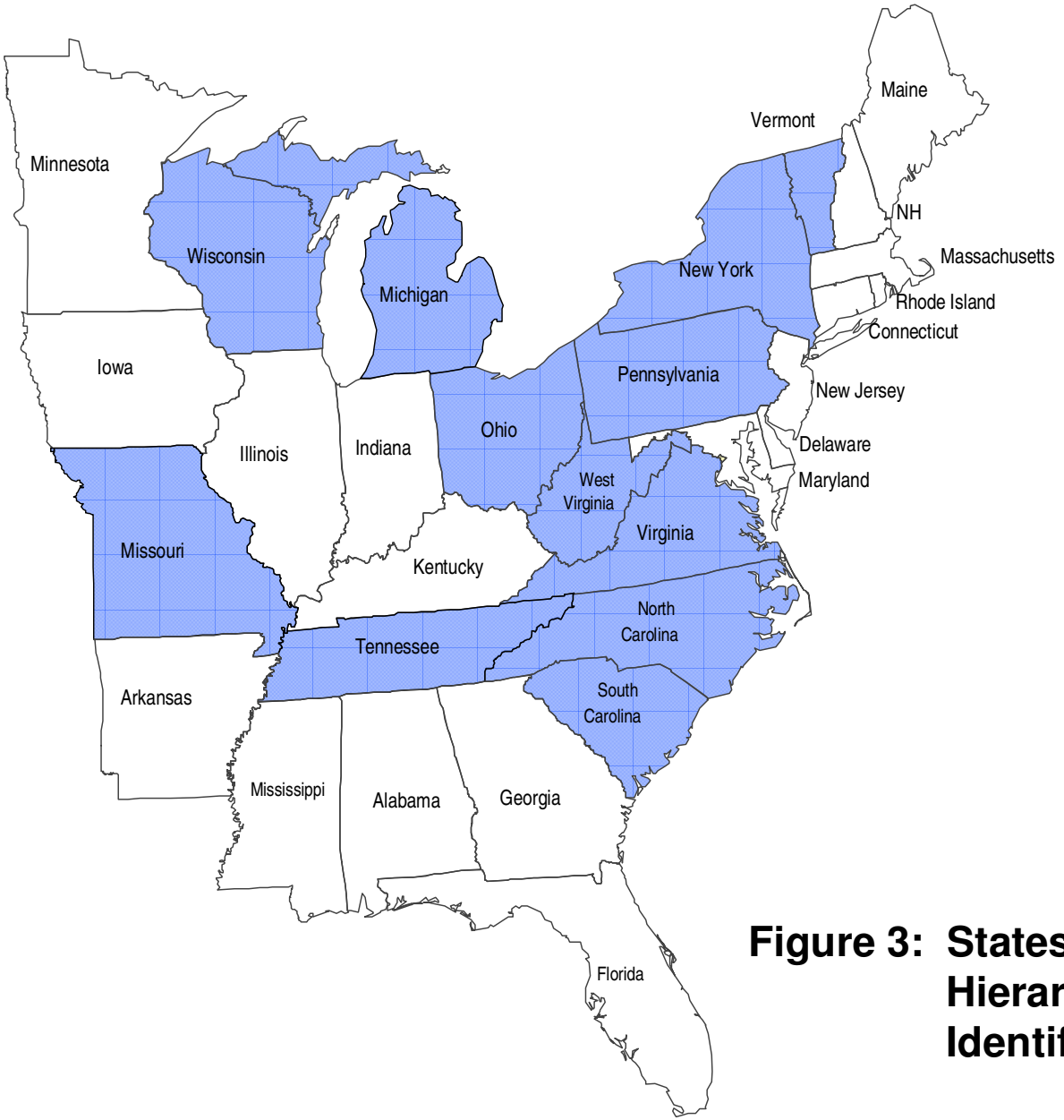

Figure 3: States Where Water Use Hierarchies Could Not Be Identified

Item 2) Review the existing Drought Management Plan to determine if it establishes an appropriate hierarchy in times of temporary scarcity/ drought? If not, what should the hierarchy be?

The New Hampshire Drought Management Plan was developed in 1990 and has not been updated since that time. The document does not establish a water use hierarchy of any kind. Rather, the plan provides information for classifying the duration and severity of drought as well as recommended conservation measures that can be implemented. Not withstanding any changes in state law, only the Governor, by declaring a state-of-emergency, could establish a hierarchy of water users if a water supply emergency existed.

Item 3) Does there need to be a hierarchy of groundwater users for any other purposes (e.g. reserving available water for specific uses in permitting decisions etc?) If so, what should it be and how should it be applied?

This document presents two approaches for forming a hierarchy of groundwater water users. It does not prescribe a groundwater-use hierarchy. Both approaches presume application to water supply emergencies arising from events such as droughts or infrastructure failures. The approaches are not designed to reserve water resources for future uses or make long-term water use management decisions based on the merits of a given water use. The Subcommittee understands that the concept of reserving water for future uses is much more complex and that other efforts are underway pursuant to HB 1609-Pilot Groundwater Management Plan to assess this concept. Furthermore, the Subcommittee recognizes that recently adopted legislation, HB 1353, requires the Groundwater Commission to study how to include consideration of "public benefit" in water withdrawal permitting decisions.

The Subcommittee believes that approaches for establishing a hierarchy of groundwater users developed by the Subcommittee lays out criteria and consideration for later use by policymakers, be it municipalities or the Governor's office for applying a water use hierarchy when a water supply emergency exists. The goal of the Subcommittee was to develop approaches for establishing water use hierarchies that are: 1)Justifiable based on sound technical data; 2)Legally and scientifically justifiable and nondiscriminatory; and 3) Necessary to protect the public water resources. The Subcommittee found that sufficient data does not exist to fully administer a water use hierarchy in New Hampshire that meet these criteria. Accordingly, a simple list of water use hierarchies (by actual water user or water use category) is not presented in this document. Attachment 2 of this document lists the data that would be required to begin to more definitively develop a specific water use hierarchy list.

The approaches for establishing a hierarchy of groundwater users developed by the Subcommittee are:

Approach 1: Water use priority as determined by evaluating the relative: 1) Importance of the type of water use; 2) Effect of the water use on the hydrologic system; 3) Need for and efficiency of the water use; and 4) Magnitude of the water use.

Approach 2: Water use priority as determined by a point ranking schedule that establishes tiers of the hierarchy based on water use type, environmental conservation practices and impact on the local water budget.

In completing its work, the Subcommittee identified the following as the most important outcomes associated with the use of water (not listed in priority):

- Protection of Human Health and Safety
- Economic Prosperity
- Environmental Quality
- Quality of Human Life
- Food Supply

The Subcommittee agreed that water uses associated with meeting drinking water, health and sanitation needs are always the highest priority and that for community water systems, the amount of water used to directly meet drinking water, health, or sanitation would be the highest priority. The Subcommittee also identified a number of attributes associated with an activity or entity using water as being important to consider when forming a water use hierarchy. These attributes describe the measures that are being implemented to improve overall water availability and can help mitigate shortages in drought include (not in order of priority) and are summarized as follows:

- Is all the water to be used essential for public health (i.e. drinking water consumption, reasonable bathing, medical requirements and sanitation)?

- Has water use efficiency been maximized by the user (based on water conservation measures specified in Env-Ws 390)?

- Is there no other available alternative water supply for this purpose that is more abundant/protected/safe? Has the water user diversified its water supplies to prepare for droughts?

- Is the water use nonconsumptive? Does the water use result in significant water being returned to the same hydrologic system in close proximity to the source that it is withdrawn from?

- Is the water use a non discretionary consumptive water use of less than 10,000 gallons per day for water uses other than uses associated with public health?

- Does the user utilize lower quality water over a higher quality as much as possible?

- What is the public benefit associated with the water use in terms of employment or state economic impact?

- What concessions or mitigation measures has a water user implemented to assist with mitigating the water supply emergency?

- How does the water user impact stormwater and wastewater within the aquifer and watershed? Are these resources being maintained in a sustainable manner?

The Subcommittee considered the goals and attributes of utilizing water in developing the two hierarchy approaches below. The Subcommittee also recognized that it would only be practical to apply a hierarchy to water uses that meet a minimum volumetric use threshold. The two water use hierarchy approaches developed by the Subcommittee reflect these considerations.

APPROACH 1 - WATER USE PRIORITY AS DETERMINED BY EVALUATING THE RELATIVE: 1) IMPORTANCE OF THE TYPE OF WATER USE; 2) EFFECT OF THE WATER USE ON THE HYDROLOGIC SYSTEM; 3) NEED FOR AND THE EFFICIENCY OF THE WATER USE; AND 4) MAGNITUDE OF THE WATER USE

Approach 1 develops a prioritized list of issues that should be considered by the authority responsible for implementing a water user hierarchy. Approach 1 could be used as guidance by the authority to make water use priority decisions when a water supply emergency exists. Approach 1 ensures that water uses required to protect the public health are the highest priority.

Water users potentially subject to the criteria considered for determining a water user hierarchy would be required to submit Water Use Plans to the State by a specified deadline to document the characteristics of their water use. This information would then be available in the event a water supply shortage exists. Water users that do not submit a water use plan would be ranked at the bottom of the hierarchy. A water user could make improvements to raise its water use priority ranking and resubmit its Water Use Plan. The list of priorities ranked from highest to lowest are shown below:

a. Water needed to maintain human health (i.e.drinking water, reasonable bathing, medical requirements and sanitation) with an aggregate number for a water system derived by applying some kind of multiplier on population/households served.

b. Any nonconsumptive uses of water (Nonconsumptive use means: 1) Water is diverted and returned immediately to the source at the point of extraction in the same quantity as extracted; and 2) Either water quality remains substantially unchanged or the water meets ambient groundwater quality standards.)

c Non discretionary consumptive water uses of less than 10,000 gallons per day for water uses other than described in (a) above. (Non discretionary water use is water use that is a necessity to maintain health, life, sanitation or basic business operations. It does not consider luxury water uses or water uses associated with enhancing aesthetics even if that may enhance business)

d. Consumptive water use essential for food production using efficient water use practices as described by state water conservation standards – This category accounts for the water needed at critical crop growing periods to ensure basic food commodity crops can be cultivated. It is also meant to account for water needed to maintain the life of livestock. This category does not include nontraditional agriculture activities (ornamental fruits & vegetables, turf grass) or crops that cannot be normally be cultivated in NH without the substantial use of irrigation under average precipitation conditions.

e. Water use for Businesses with a Public Benefit, Non Traditional Agricultural Operations and Water Required for the Environment and Habitat Protection (equal ranking):

1. Water that is essential for a particular ecosystem (including habitat protection for fauna or flora), taking into account ecological tolerance for short-term or single-year drought conditions.

2. Water that is essential for a business with a public benefit as determined by a ratio of economic benefit versus water use (alternatively "public benefit" could be determined in a time of shortage by the Governor by Water Council and/or Commissioners of DES, DRED, and Dept of Ag) - This category would only include the volume of water used under the assumption that state of the art water conservation practices are being applied - The business would also have to show there are no viable storage options or alternative off-site sources of water available for use (for example, a bottled water facility could use off-site sources of water).

f. Household, business and other discretionary and inefficient water uses - Inefficient water uses would include outdoor uses of water not listed above and not meeting the minimum conservation measures set forth in state water conservation regulations Env-Ws 390.

APPROACH 2: WATER USE PRIORITY AS DETERMINED BY A RANKING SCHEDULE BASED ON WATER USE TYPE, ENVIRONMENTAL CONSERVATION PRACTICES AND IMPACT ON THE LOCAL WATER BUDGET

Approach 2 combines concepts contained in Approach 1 and applies a point ranking system to determine a priority of water users. Each entity using more than 10,000 gallons a day of water would need to complete a water use plan by a specified time period. Users not completing the plan would have the lowest priority. The water use point ranking schedule would be used to develop different tiers of water use hierarchies. The proposed point ranking schedule is shown in Table 2, below.

Table 2: Water Use Hierarchy Ranking Schedule

For all water users that exceed 10,000 gallons a day of water use (including customers of community water systems) with some consumptive water use, provide answers to the following questions.

		Ranking Criteria	Points
		Life Sustaining/Human Health (drinking and sanitation)	**40**
a		Is all the water to be used essential for public health? Community water systems shall enter 40 points. Individual customers of community water systems that use more than 10,000 gallons per day shall be evaluated separately	0-40 Based on percentage of water that is used for hydration, reasonable sanitation or other specific health need.
		Environmental Considerations	**30**
b		Does the water use result in significant water being returned to a substantially the same are of the source that it is withdrawn from?	0-12 based on the percentage of water that is used that is returned to the same aquifer.
c		How does the water user impact stormwater within the aquifer. Is this resource being managed to optimize the recharge of stormwater to groundwater when appropriate?	0-4 based on the degree of stormwater management processes that have been implemented to maximize recharge where appropriate at the facility.
d		What concessions or mitigation measures has a water user implemented to assist with mitigating the water supply emergency? (timing of use, diversification of supply sources, voluntary reductions in water use)	0-7 based on the degree a water user has substantially modified its processes in response to a water supply shortage.
e		Has water use efficiency been maximized by the user?	0-7 based on the degree a water user is implementing water conservation activities as described in Env-Ws 390
		Economic Value	**30**
f		How many employees does the business employ?	0-15 determined by the ratio of water use to the number of full time equivalent workers whose jobs are tied to the water use
g		What is the direct monetary contribution to state or municipal taxes or fees associated with the water use activity	0-5 determined by the ratio of water use to the amount of revenue that is directly paid to the state.
h		Unless water is use is allowed, the viability of a business activity or agricultural activity may be permanently damaged.	0-10 determined by the degree of irreversible damage that may occur if water use is restricted or not allowed.

ATTACHMENT 1
Actions that Can Be Taken By a Water User to Be Prepared to Mitigate the Effect of Water Shortages

1) **Demand Reduction/Water Conservation** - Experience has shown that it is possible to reduce water demand by 10%-40% by implementing water conservation measures. Where water is being used to grow grass for aesthetic purposes only, there is an opportunity to conserve 100% of the water that is used. Extensive resources are available for practically every type of water use to assist with identifying and implementing water conservation measures. Reducing the amount of water that is required by a particular water user would assist with abating a water supply shortage as well as reduce the susceptibility of a given water user to any mandatory reductions in use.

2) **Develop and Utilize Water Storage Structures** - Water users may develop large or small scale water storage structures ranging from holding ponds to tanks. Large water storage structures could be designed to store many millions of gallons of water that could be used when a water scarcity exists and filled when water supply is adequate. Smaller storage structures that hold generally less than a million gallons of water could be used to dampen maximum withdrawal rates during discrete periods of time when water use is peaking and a water supply shortage is occurring.

3) **Water Shortage Contingency Plans** - All water users, including water systems, businesses, agriculture, and residents with private water supply wells, need to understand that droughts and other water supply emergencies do occur in New Hampshire. Contingency plans, insurance, financial resources, financial planning and mutual aid agreements need to be established to effectively cope with the effects of water supply shortages.

4) **Interconnect with Other Water Users** - In some instances, water users may benefit from interconnecting with one another and coordinating in the use of multiple water resources to lessen the impact of water supply shortages on both the users and the environment.

5) **Diversify the Type and Location of Water Sources** - A water user that develops water sources distributed over a broad area will be less constrained by the sustainable yield/competing water uses at a particular point in a watershed or aquifer. Water users that develop different types of water sources will also be more insulated from the effects of a water supply shortage. For instance, water storage reservoirs, rivers, wells constructed in sand and gravel aquifers, and wells constructed in bedrock aquifers would likely not all be impacted at the same time or to the same extent when a drought occurs. Diversifying the type and location of water supply sources also would lessen the susceptibility of a water user to a single contamination event.

6) **Reactivate Previously Abandoned Water Sources** - Occasionally sources have been abandoned due to water quality issues or high costs associated with operating and maintaining a particular water source. Improvements in water treatment technology or the risks associated with being impacted by a water supply scarcity may make the reactivation of sources previously abandoned prudent or more feasible.

7) **Identification and Development of Strategies to Access Alternative Supplies** - Potential alternative sources of water can be identified and strategies developed to access those supplies in a time of shortage. For instance, there are numerous examples where water systems utilized water from emergency sources such as a surface water body or wells not previously connected to a water system to abate a water supply shortage. Other users have developed plans to lower water reservoir intakes to gain access to additional water stored within the reservoir.

ATTACHMENT 2

DATA NEEDS TO IMPLEMENT A HIERARCHY OF WATER USERS DURING A WATER SUPPLY SHORTAGE

Criteria for Determining When and Where a Hierarchy of Water Users Should be Implemented - It is assumed that a hierarchy would be triggered when a specific water resource becomes diminished and is no longer able to support existing uses.

If the purpose of the water use hierarchy is to protect organisms on a site specific basis during periods of extreme low flows, an extensive list of hydrologic data will be required to complete the resource evaluation and trigger the implementation of a hierarchy. If the purpose of the hierarchy is to protect organisms in a more generalized manner, the drought emergency or drought disaster criteria in the drought management plan could be utilized.

Information required to implement a hierarchy of water users is listed below. Currently the state identifies water users that withdrawal, transfer or discharge more than 20,000 gallons/day. This is accomplished by enforcing the water use registration and reporting program requirements of RSA 488. Enforcement of the program initiated one year ago and consists of part of one staff person's time. Much of the information listed below can be captured by implementing the requirements of RSA 488. Although data has been collected for twenty years, much of the water user information and use data historically was not verified. Verification of the data is ongoing and likely will be substantially complete in five years. *The information listed in italics below identifies data that currently is not collected by DES at this time.*

a) *Identification of water users with sources utilizing more than 10,000 gallons/day.* (RSA 488 authorizes DES to only track water users with sources utilizing more than 20,000 gallons/day)

b) Need for the withdrawal - A detailed explanation of the need for the water

c) Description of withdrawal
   - Amount of the withdrawal including typical withdrawal patterns over seasonal, monthly and daily cycles
   - Location of water source
   - Type of water source
   - Destination of water that is used
   - Users and facilities related to the water withdrawn
   - Population served and category of customers served (if applicable)
   - *Alternative Sources of Water*
   - *Water storage*

d) Water Use characteristics
   - *Water conservation measures implemented by the user*
   - Volume of water use that is consumptive and nonconsumptive
   - *Is the water use discretionary (does it impact the public health or directly change the financial viability of a user)?*
   - *Are lower quality water sources used over higher quality as much as possible?*
   - *Concessions or mitigation measures a water user implements to assist with mitigating a water supply emergency*
   - *How much of the water use is needed to maintain human health (i.e. drinking water, reasonable bathing, medical requirements and sanitation)?*

e) Other Considerations
   - *Public benefit associated with the water use in terms of economic impact*
   - *How does the water user impact stormwater and wastewater within the aquifer and watershed?*
   - *Is the water use directly affecting the habitat of organisms?*
   - *Is the water use directly impacting rare or endangered organisms?*

Attachment E

Water Use Fees

Fees On the Use of Water

October 2010

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Tables

Attachments

1.0 Introduction

As required by legislative statute, the Groundwater Commission was required to evaluate water use fees as part of its duties and the Commission formed a Water Use Fee Subcommittee (subcommittee) to research this issue and satisfy this legislative requirement. The subcommittee evaluated the application of water use fees to generate revenue to finance groundwater water protection initiatives developed during the course of the Groundwater Commission's work in order to assist in monitoring, protecting and managing New Hampshire's groundwater resources. The subcommittee recognized that there are several other state and local revenue generating mechanisms that could be used to fund groundwater water resources protection and management efforts in New Hampshire. However, the Legislature specifically identified that the concept of water withdrawal fees should be studied by the Groundwater Commission. In this context only, the subcommittee has assessed water use fees. The work of the subcommittee does not include an analysis or specific recommendation of what mechanism(s) New Hampshire should use to fund its groundwater protection and management programs. This report is intended to provide basic information about how water use fees could most equitably be applied if this funding approach is considered in the future. The neutrality of the subcommittee on the question of the establishment of water use fees is not re-iterated throughout the report, but is a critical premise that is associated with all information contained here-in.

2.0 Background

House Bill 215 of 2003 set forth the duties of the Groundwater Commission as follows:

> *305:3 Duties. The commission shall study ways to bring a balanced approach to water use among residential, public water supply, industrial, commercial, agricultural, energy, recreational, and other water users, and to improve the current process by which new water users may reasonably and efficiently use state water resources, including consideration of potential regional impacts and local water management issues, in order to best protect and preserve an adequate supply of water for the state with particular attention to groundwater. This study shall include consideration of issues such as potential impacts on New Hampshire's environment, property rights as they relate to groundwater,* ***possible fees on water withdrawals****, and the protection of New Hampshire's aquifers.*

The Commission developed a work plan to guide its work in November 2005. The Commission included "Fee on the Commercial Consumptive Use of Groundwater" in its

work plan and identified the following questions and information needs as being important to consider as the Commission completed its work on this topic:

- Identify and review what other states are doing in this area.
- Should commercial users of (some threshold amount of) groundwater pay a fee?
- If so, how do you define consumptive (i.e. which users should pay?), what should the fee be, how should it be applied and collected, what should the fee be used for?

This subcommittee report summarizes the information gathered to address these questions raised in the Groundwater Commission's work plan. The subcommittee that worked on the development of this report also included a summary of past efforts in New Hampshire to establish water use fees and legal thresholds that must be considered when proposing new fees or taxes.

3.0 New Hampshire's Authority to Impose Fees and Taxes

A tax is an assessment designed to raise unrestricted revenue to fund the general operations of government. Fees are often small assessments designed to pay for the cost of regulation of that specific activity. Statute often limits the charge to the actual cost of regulation or dedicates the revenue to a specific regulatory fund. Vehicle registration fees, for example, are placed in the highway fund.

New Hampshire's Legislature has discretion in selecting the objects and methods of taxation. New Hampshire's Constitution mandates that all tax legislation meet the requirements of public purpose, equality, and reason. Part II, Article 5 of New Hampshire's Constitution requires that all taxes be proportionate and reasonable, equal in valuation and uniform in rate, and just. For example, a highly selective tax may be attacked as violating equal protection, lacking reason, creating an improper classification, and being disproportional.

Under Part II, Article 6 of the constitution, the Legislature has broad power to declare property to be taxable or non-taxable based upon a rational classification of the property's kind or use. So long as it is applied to property, classification under Part II, Article 6 need only meet the public purpose, equality, and reason standard. A narrow classification of property that fails to include similar property defined by the same characteristic event is possible but may considered unconstitutional because a narrow classification may be considered insufficiently distinct or as an excise fee. These types of legal considerations came up frequently when legislation to enact water use fees for specific types of water uses in New Hampshire (see Section 5.0) was historically proposed.

Taxes not levied based on classifications of real estate or personal property must be justified under some other power (as, for example, fees to recover costs of implementing a regulatory program, special benefit assessments, or penalties).

A thorough review of legal aspects of taxation in New Hampshire has been prepared by Marcus Hurn from the Franklin Pierce Law Center and is available online at http://www.piercelaw.edu/assets/pdf/pierce-law-review-vol07-no3-hurn.pdf.

4.0 Existing Taxes or Fees Associated with Natural Resources

Currently under the New Hampshire Constitution, both earth (sand, loam, gravel etc.) and timber are considered to be real estate. In order to avoid encouraging people from prematurely harvesting trees to avoid property taxes, the New Hampshire Constitution states that timber may only be taxed on the rate in which it is harvested. Similarly, due to difficulty of estimating the volume of earth resources, and to discourage the pre-mature mining of these materials to reduce real estate property taxes, the Legislature passed a law exempting these materials from being taxed as real estate, and instead be taxed as they are mined.

Numerous state statutes also establish personal and commercial license fees for fishing and hunting in New Hampshire.

Groundwater and surface water is also a natural resource that can be consumed. Under common law in New Hampshire, a property owner does not own water resources. Rather, a property owner has a right to reasonably access and use these resources from his or her land.

5.0 Historic Legislative Water Use Fee Initiatives

Historic legislative efforts to apply fees directly or indirectly to water use via proposed fees on bottled water containers and other beverage containers have been considered by the Legislature on an almost annual basis. None of these legislative proposals were adopted by the Legislature. The intent, requirements, and arguments against these bills are summarized in Attachment A. In addition, there has been various water use fees proposed but never actually incorporated into legislation establishing the state's two year budget.

A number of the historic legislative initiatives narrowly targeted bottled water by proposing to apply a fee on the extraction of water for bottled water or a fee only on bottled water containers. Beyond the philosophical arguments about the benefit and harm of instituting new fees, many stakeholders opined that a narrow fee on bottled water is unconstitutional because provisions in the New Hampshire Constitution that address equal protection, excise fees, lacking reason/adequate rational, and improper classification of property (see Section 3). Stakeholders have also testified that many of the legislative proposals relating to water use fees over the last ten years, as introduced, would have had unintended financial consequences to either businesses or the public. In each instance, the respective legislative committees either immediately

voted these legislative initiatives as “inexpedient to legislate” without considering amendments or to “interim study”, but did not follow through on the studying or proposing amendments to the legislation being considered.

6.0 Water Use Fees in Other States

Based on a literature review by the commission at least thirteen states have implemented a water use fee. Additionally, regional water authorities such as the Delaware River Basin Commission and the Susquehanna River Basin Commission have implemented a water use fee requirement. The water use fees are summarized in Attachment B, along with how each state uses the revenue generated from the fees. The summary included in Attachment B does not include “water right” or permit application fees.

Arkansas, Kansas, Massachusetts and Rhode Island each have implemented water use fees that apply only to public water systems. In 2008, Minnesota, in a general election ballot question, voted to amend the State’s constitution to increase the state’s sales tax for twenty-five years, with a portion of the increase being dedicated to protecting the state’s water resources.

In some states, revenue is generated that is indirectly related to water use. Primarily, this revenue is generated in the form of a sales tax that applies to certain bottled beverages. At least thirty-two states apply a sales tax of up to 7% on certain bottled beverages. At least eighteen states specifically exempt bottled water from existing state sale taxes. Eleven states have "bottle bills". These states require that a monetary deposit be included in the sales price of select bottled beverages. The deposit is then recovered when the empty bottle is returned to a redemption center. Often, many bottles are not redeemed and unredeemed money is used as revenue in some states. At this time, Hawaii, Oregon, New York, Connecticut and Maine include bottled water in the "bottle bill" program. Other states exempt bottled water from their bottle bill. The City of Chicago is applying a $0.05 tax per container of bottled water that is sold by wholesalers to retailers in the City. Detailed state beverage sales statistics can be obtained from the Container and Packaging Recycling Update (http://www.container-recycling.org/bmda/) and potentially other consumer marketing companies.

7.0 Water Use in New Hampshire

New Hampshire requires entities using more than 20,000 gallons a day of water, averaged over a thirty-day period, to accurately measure and report monthly water use. Excluding water use associated with hydropower and non-evaporated water use associated with thermoelectric power, water users required to report water use to NHDES withdraw approximately 130 million gallons per day (see Table 1).

The United States Geological Survey (USGS) estimates the total water use for each state every five years (USGS Circular 1344). In 2009, the USGS published estimated water use in New Hampshire for the year 2005. Excluding water use associated with hydropower, total water use (including the water use not reported to NHDES) in New Hampshire in 2005 is estimated to be 215 million gallons per day (Table 2). Public water supply uses the most water (46% of total water use or 99.8 million gallons per day) and surface water use (51% of total surface water use or 62.6 million gallons per day). On-lot private domestic wells, where 44% of the state's population obtains its drinking water supply, is the category with the highest groundwater use accounting for 44% of the groundwater used in the state (41.6 million gallons per day).

Summaries of the categories and associated water use reported to NHDES and USGS are shown in Tables 1 and 2 below. Table 1 summarizes the water use that is measured and reported by users using more than 20,000 gallons a day. Table 2 estimates all water use (including uses less than 20,000 gallons per day) in New Hampshire using available data and statistical estimates.

Table 1: Water Use by Entities that Use More that 20,000 Gallons Per Day and Report Water Use to NHDES in 2009 (gallons per day-annual water use divided by 365 days)

	Surface Water	Groundwater	Total	Percentage of Use (%)
Public Water Supply	54,367,884	30,118,315	84,486,199	65.1%
Agriculture – Field	158,808	13,799	172,607	0.1%
Agriculture – Greenhouse	1,156	77,156	78,312	0.1%
Agriculture – Livestock	0	0	0	0.0%
Aquaculture	11,299,789	7,683,744	18,983,533	14.6%
Bottled Water	0	171,893	171,893	0.1%
Commercial	2,447,510	3,453	2,450,963	1.9%
Forestry & Lumbering	74,684	27,715	102,399	0.1%
Groundwater Remediation	0	592,966	592,966	0.5%
Industrial	7,323,616	2,975,091	10,298,707	7.9%
Irrigation (non agriculture)	1,196,404	139,309	1,335,713	1.0%
Institutional	46,405	767,150	813,555	0.6%
Mining	1,431,326	214	1,431,540	1.1%
Power (fresh water consumed only)	4,535,435	627,515	5,162,950	4.0%
Snow Making	3,641,525	3,193	3,644,718	0.1%
Total Water Use	86,524,542	43,201,513	129,726,055	

Table 2: Total Fresh Water Use in New Hampshire Estimated By the United States Geologic Survey for 2005 (gallons per day - annual water use divided by 365 days)

	Surface Water	Groundwater	Total	Percentage of Use (%)[1]
Public Water Supply	62,600,000	37,200,000	99,800,000	46.3%
Domestic (on-lot wells)	90,000	41,600,000	41,690,000	19.4%
Irrigation (includes agriculture and non agriculture uses)	4,060,000	450,000	4,510,000	2.1%
Agriculture - Livestock	300,000	890,000	1,190,000	0.6%
Aquaculture	10,700,000	7,010,000	17,710,000	8.2%
Industrial	35,900,000	5,650,000	41,550,000	19.3%
Mining	3,740,000	20,000	3,760,000	1.7%
Power (fresh water consumed based on NHDES data)	4,535,435	627,515	5,162,950	2.4%
Total Water Use	121,925,435	93,447,515	215,372,950	

8.0 Groundwater Resource Funding Needs

The majority of New Hampshire's existing groundwater management initiatives are not directly funded by the State. Under Performance Partner Agreements with the United States Environmental Protection Agency (EPA), funding from EPA to implement the requirements of the Federal Safe Drinking Water Act are allowed to utilized to partially fund state water resources protection initiatives that are complimentary to the federal requirements. The Groundwater Commission has identified several programs that are needed to adequately manage groundwater in the state. The funding needs for these programs was estimated by NHDES to total approximately $1,424,000 in reoccurring annual costs with and addition $434,000 associated with one time costs. Additionally, during the last legislative session, the Water Supply Land Grant program was dropped as a measure to help balance the state budget. This program was previously paid for at a rate of $1,500,000 per year from the General Fund. When funded, this program was successfully preserving valuable water supply land by offering a 25% matching grant to municipalities and non profit organization to purchase or place easements on land delineated as source water protection areas through out the state. In addition to these programs, it is estimated that it would cost an additional $50,000 for NHDES or another state agency to administer a water use fee collection program

Existing state statutes (RSA 4-C:19 – RSA 4-C:23 & RSA 485:49-485:53) and potential amendments to these statutes being discussed by the Groundwater Commission stipulate that NHDES, the regional planning commissions and the Office of Energy and Planning (OEP) should assist municipalities in developing Water Resource Protection Plans. Yet, the regional planning commissions, NHDES and OEP are not provided any funding from the State's general fund to complete this work. Additionally, the Groundwater Commission is currently assessing multiple approaches to improve the management of groundwater at the regional and municipal levels in the state. These approaches include developing model ordinances to assess water availability for projects with water withdrawals that are not regulated by NHDES and the development of local and regional water use consumption plans. Because New Hampshire has not provided funding for local and regional water resources planning, water resource planning is not proactively occurring in many of the rapidly developing areas of the State.

The Groundwater Commission Data Needs subcommittee concluded that New Hampshire has a deficient groundwater level and quality monitoring network. Although fifty percent of the state's population derives its drinking water supply from bedrock in New Hampshire, the monitoring of bedrock groundwater conditions is occurring at only nine locations on a limited basis. This is because New Hampshire provides funding for a staff person to conduct groundwater monitoring for one week a month and within the last ten years has only provided limited funds in one Capital budget cycle to establish additional monitoring sites. Without an adequate groundwater monitoring network, it is

difficult to identify water availability and water quality trends and proactively implement appropriate response actions.

Lastly, New Hampshire is under funding geologic mapping of the state. Geologic maps provide the baseline information for identifying and characterizing aquifers within the state. Geologic mapping is also important for the management and protection of groundwater, because maps can identify where water resources may be available for development, where recharge areas to aquifers exist, and can be used to predict water quality problems (examples: radon, arsenic, uranium) that are typically associated with specific rock types. It is important to prioritize appropriate areas for protection to guard existing and future water supply sources. The Federal Government, through the USGS Statemap program, offers 50% matching funds for states to complete geologic mapping. Currently New Hampshire does not fully match available federal matching funds to complete this work. Each state can be awarded up to $300,00 per year, and over the past 10 years New Hampshire's average award was $63,916 (source: USGS Statemap Program Statistical Report). New Hampshire has only mapped 45% of its surficial geology mapped at the national standard scale (1:24,000) that can be used to make detailed localized and regional assessments. Currently only 12 % of the bedrock of New Hampshire is mapped at this scale. The Bedrock of the state has been mapped at the general scale of 1:250,000, (Lyons and others, 1997) but this is not an acceptable scale to conduct localized assessments, which is where there is the most demand.

A summary of the funding needs and associated costs to adequately manage groundwater is listed in Table 3.

Table 3: Groundwater Management Funding Needs in NH (see Data needs Report and HB1353 Report at NHgroundwater.com)

Program	Activity	Cost	Comments	Benefits
Regional Planning Commissions	Regional/Local Water Quantity Planning (assist with adopting and enacting HB1353 model ordinances) Assist with Water Resource Protection Plans including Water Use Plans	$630,000	Regional Planning Commissions currently have minimal no funding to assist with local or regional water supply projects. Assume funding is required for one staff position at each regional planning commission. [Existing but unfunded/inactive activity]	• Land use development will be consistent with available water resources • Planned future water supply needs will be protected • Regional planning among multiple municipalities will occur.
NHDES/OEP -	Assist with Water Resource Protection Plans for Master Plan Development	$84,000	Assume one position. Note that State established this assistance program, but the budget does not fund it. [Existing but unfunded/inactive activity]	• Master plans will consider available water supply, existing water uses and future water needs
NHDES/Regional Planning Commission/Grants for Towns to Hire Consultants	Consumptive Water Use Plans - ($1300/square mile/ .8 square mile/day work completed)	$400,000	Would allow 307 square miles per year to be assessed (assume typical town size is 20-50 square miles) [New activity being considered by the Groundwater Commission]	• Provide communities resources to assess existing and future water needs and water availability and to use this information for planning purposes
NHDES/NHGS	Town Bedrock Mapping/Water Quality/Well Yield Analyses Planning Projects	$70,000	Assume one position and 5k for analytical analyses [New activity]	• Land use development will be consistent with available water resources • Protect public health and quality of life by providing water quality and quantity information based on varying geologic conditions.
NHDES/NHGS	Water Level and Quality Monitoring Network O&M - Equipment and one staff position	$90,000[1]	Assume 25k equipment/travel, computer support & one full time position. [Expansion of an existing activity recommended by the Groundwater Commission]	• Measure if water use, landscape change and climate change is affecting the availability and quality of groundwater resources
NHDES/NHGS	Surficial Geology Mapping (assists with local and regional water quality planning and protection). Takes advantage of Federal funds the state is not leveraging.	$150,000	State would receive another $150,000 in matching funds from the Federal government. NH does not match the full amount of federal funding that is available. [Expansion of an existing activity that is not fully matching available federal funds]	• Identify underground sources of water and associated recharge areas • Secondary benefits for mining & landform hazards identification (erosion and landslides)

Note 1: An additional $434,000 as a one time cost is required to establish the water level monitoring network
Note 2: Not included in the table is the cost of implementing a water use fee program ($50,000 per year)

9.0 Water Use Fees

The subcommittee studying water use fees for the Groundwater Commission assessed the magnitude of the fees that would be needed to pay for groundwater management needs outlined during the course of the commissions work. The subcommittee did not assess if members of the subcommittee actually supported the water use fee concept. Further, the subcommittee did not specifically consider legislative language, the legality of such a fee, evaluate the impact of fees on specific stakeholders, or evaluate implementation strategies for a fee. The evaluation or implementation of any water use fee would require careful consideration of these issues and was determined to be beyond the scope of the subcommittee considering its responsibilities spelled out in Section 2 of this report.

A fee extending to all water users was considered to simplify fee calculation and to ensure basic fairness across all water users. The subcommittee received comments from a subcommittee participant that surface water users should not be included in this calculation of fees to support ground water initiatives (Attachment C). This sentiment was shared by others on the subcommittee. Others on the subcommittee felt that the hydraulic interconnection between surface water and ground water warranted inclusion of surface water users and that programs suggested by the Ground Water Commission would benefit surface water users as well as ground water users. The subcommittee determined that a fee of $0.02 per 1000 gallons used would approximately generate sufficient revenue to fund the groundwater management activities identified by the Groundwater Commission as be a priority. A fee of $0.04 per 1000 gallons used would generate sufficient revenue to fund both groundwater management activities and the Water Supply Land Conservation program that currently is unfunded. The subcommittee noted that even private well owners could be subject to the fee as they also benefit from groundwater management initiatives.

A calculation of revenue that would be generated by a water use fee of $0.02 per 1000 gallons is described below:

Total Water Use Reported(from Table 1):

129,726,055 gallons/day or 47,350,010,075 gallons/year

47,350,010,075 gallons x $0.02/1000 gallons = $947,000

Estimated Water Use in Domestic Wells:

Approximately 250,000 domestic wells in New Hampshire
Assume each home uses 250 gallons per day or 91,250 gallons per year
91,250 gallons per year x $0.02/1000 gallons = $1.83 per domestic well

250,000 homes with domestic wells x $1.83 = $457,500

Total Revenue: $947,000 + $457,500 = $1,404,500

The implementation of the fee described above does not capture non domestic water uses that are below the reporting threshold of 20,000 gallons per day. Contributions by these populations of water users would be required to achieve basic fairness. The USGS has published two reports that include an estimate of water use by businesses based on the type of business and the size of the business generally determined by the number of people employed (See USGS SIR 2007-5157 and OFR 2009–1168).

A fee of $0.02 per a thousand gallons would cost a large public water system that serves over 100,000 people and extracts 20 million gallons per day about $146,000 per year. A smaller system serving about 18,000 people and extracting 2.5 million gallons per day would pay about $18,250 per year.

The subcommittee stressed that any proposed water use fee should be solely preserved for use for only water related management activities as outlined during the course of the Ground Water Commission's work and appropriate protection measures should be applied to prevent alternative uses of the revenue.

The subcommittee noted that many water users already collect environmental monitoring data and make this available to the state. Much of this data supports the type of activities summarized in Table 3. The subcommittee noted that the costs paid by the water users to collect this data could conceptually be credited towards a water user's fee.

References:

Lyons, J.B, Bothner, W. A., Moench, R.H, and Thompson, J.B., 1997. Bedrock Geologic Map of New Hampshire, U.S. Geological Survey, Reston, VA, State Geologic Map, 2 sheets, scale 1:250,000

Attachment A: Summary of Past Legislative Proposals to Assess Fees to Certain Types of Water Uses or Beverages

Bill Number	SB 396	CACR 20	HB 540	HB 1356	HB 1737	HB 891	HB 899	HB 283
Year	2000	2003	2003	2003	2006	2007	2007	2009 & 2010
Summary	Assess a $0.02/gallon fee for water extracted in NH for the purpose of sale as bottled water	This bill would have stipulated in the NH Constitution that the state may provide rates or taxes for the purpose of preserving water and gravel extracted from the state. Currently under the NH Constitution, both earth (sand, loam, gravel etc.) and timber are considered to be real estate. However, in order to avoid encouraging people from prematurely harvesting trees to avoid property taxes, the NH Constitution states that timber may only be taxed on the rate in which it is harvested. Similarly, due to difficulty of estimating the volume of earth resources, and to discourage the pre-mature mining of these materials to reduce real estate property taxes, the legislature passed a law exempting these materials from being taxed as real estate, and instead be taxed as they are mined.	Establishing a committee to study a fee on withdrawals of water for commercial purposes.	Proposed a fee of $.05 per gallon of water withdrawn from a water supply source in New Hampshire for the purpose of sale as bottled water. The bill would only tax new withdrawals for bottled water, or increased withdrawals from existing sources of bottled water. Existing withdrawals for bottled water would be exempt up to the extraction volumes they produced prior to the effective date of the proposed legislation	Proposed a $0.02/container fee for containers up to one gallon and a $0.05/container for containers larger than one gallon for beverages sold for resale in NH no matter where the product originated. Beverage was defined as all still and carbonated drinks; fruit juices and all beverages compounded therefrom; all bottled waters, whether for medicinal or table use; and all packaged liquids intended for use in the manner of drink. Milk and unmixed products thereof, and fruit juices and waters retailed exclusively by the producer or manufacturer direct, were proposed to be exempt under the bill.	Proposed a $0.02/container fee for containers up to one gallon and a $0.05/container for containers larger than one gallon for beverages sold for resale in NH no matter where the product originated. Beverage was defined as all still and carbonated drinks; fruit juices and all beverages compounded therefrom; all bottled waters, whether for medicinal or table use; and all packaged liquids intended for use in the manner of drink. Milk and unmixed products thereof, and fruit juices and waters retailed exclusively by the producer or manufacturer direct, were proposed to be exempt under the bill.	Proposed a $0.10/gallon fee of water withdrawn in excess of 50,000 gallons per day from a water supply source in New Hampshire for the purpose of sale or resale. The bill exempted municipal water systems.	$0.01/container for the first sale of a beverage with a container in the State.
Fee/Tax Assessed	$0.02/gallon	None specified	Not applicable	None	$0.02/container up to 1 gallon and $0.05/container larger than 1 gallon	$0.02/container up to 1 gallon and $0.05/container larger than 1 gallon	$0.10/gallon	$0.01/ container
Estimated Amount of Annual Revenue Generated	$1,474,600	Not applicable	Not applicable	Minimal - In 2003, new facilities for bottled water were not coming online. Extraction rates from most existing facilities were decreasing	Not estimated	$12,480,000	Not estimated	$10,000,000
Annual cost of Administering the fee/tax	$50,000	Not applicable	Not applicable	Minimal	Not estimated	Not estimated	Not estimated	Not estimated
Proposed Use of Revenue Generated	Water Supply Land Grant Protection	Not applicable	Not applicable	Not specified	30% - LCHIP Trust Fund; 10% dam maintenance fund; 10% water resources and supply protection program; 10% rivers and management protection program; remainder to the general fund.	Not Specified	Not Specified	Various uses associated with comprehensive solid waste management (state, municipalities, non profits and businesses share the revenue)
Problems with the bill as described by various stakeholders	1) Violation of Constitution (A1; 2) Unfair to NH businesses - out of state bottlers doing business in NH would not have to pay taxes; 3) Would the tax apply to bottlers that purchase water from community water systems? 4) Why would the fee not apply to other bottled beverages? 5) Why doesn't the fee apply to other consumptive uses of water? 6) Some bottlers explained that the proposed fee exceeds the $0.01-0.02/gallon profit margin for their business.	1) Groundwater beneath a property is not owned by a person owing the property - so there is no ability to tax the value of this resource as real estate (thus the constitutional amendment is not needed); 2) The legislature already has authority to assess taxes and does not need clarification in the Constitution on this matter.	None - Incorporated into the SB 155 Groundwater Commission Scope of Work	1) Violation of Constitution (equal protection, excise fee, lacking reason, improper classification of property); 2) Fee exceeded profit margin per gallon of water extracted; 3) NH bottled water companies could not compete with companies in neighboring states; 4) Did not address companies that purchase water from community water systems.	1) Tax may have been applicable many times to a single container as product passed through multiple re-sellers; 2) Although the bill intended to exempt basic food staples such as milk, stakeholders identified flaws with the bill such that certain critical food staples such as soy based baby formula would be taxed.	1) Tax may have been applicable many times to a single container as product passed through multiple re-sellers; 2) Although the bill intended to exempt basic food staples such as milk, stakeholders identified flaws with the bill such that certain critical food staples such as soy based baby formula would be taxed.	1) Violation of Constitution (equal protection, excise fee, lacking reason, improper classification of property); 2) Many community water systems not affiliated with a municipality would have had to pay the tax; 3) The tax, when passed onto customers of non-municipal water systems subject to the tax, would have been unfeasible (over $7000/household). The sponsors of the bill probably meant to exempt all community (not just municipal) water systems (those owned by companies, homeowner associations, etc.)	Bottlers and grocers opposed the bill due to economic impact

ATTACHMENT B: SUMMARY OF STATE AND INTERSTATE WATER USE FEES

JURISDICTION	STATUTE	RATE	USE OF REVENUE
Delaware River Basin		For surface water, $0.06/1000 gallons for consumptive use & $0.0006/1000 gallons for nonconsumptive use. There is no fee for groundwater unless the water is transferred to a stream and then withdrawn	Funds are used to fund projects and environmental reviews/program overseen by the Delaware River Basin Commission.
Susquehanna River Basin Commission		Complex rate structure - see http://www.srbc.net/forms/docs/projectfeeschedule_09.pdf	Funds are used to fund projects and environmental reviews/program overseen by the Susquehanna River Basin Commission.
Alaska	4	$2/Acre Foot - $30/Acre Foot when water is displaced from certain hydrologic units. The rate is variable and depends on how much water is removed from a hydrologic unit and what hydrologic unit the withdrawal occurs in. The fee is graduated to encourage the conservation of water.	The fee is used to encourage water conservation and to maintain the State's Water Management Plan.
	11 AAC 05.010(a)(8)(M)	Administrative fee of $50/year for non residential uses of water or for other uses that are less than 500 gallons per day.	Collect data and maintain the state's water quantity regulatory programs.
Arizona	A.R.S. 45-611 & version 2.	$1-3 per acre foot depending upon the Active Management Area	Funds are used for water quantity regulatory programs
	A.R.S 42-5302	Municipal Water Systems pay $0.0065/gallon of water delivered	Funds are combined with other revenue sources to fund various water quality and quantity programs and projects.
Arkansas	ACA. § 15-22-901	$10 annual water use fee is required on any non-domestic well that is capable of producing greater than 50,000 gallons per day (35 gpm).	Fees collected are utilized for cost-share on water conservation practices, administration, and information/education programs.
California	Title 23, Div 3 1062, 1064, 1066, 1070	Majority of water users pay $100 plus an additional $0.030/acre-foot greater than 10 acre feet	Revenue funds various water management programs
Florida	Chapter 40A-2, FAC	*Florida has a Consumptive Use Permit (CUP) with an associated fee and a well construction permit fee. These permits are issued by Florida's Water Management Districts. There are five Water Management Districts in Florida. The well construction permit fee is charged only once when a well construction permit is application is made. The CUP has a 20-year duration and is renewable. Each Water Management District sets permit fees. Typically, a CUP for a typical Community Water System in the South Florida Water Management District will cost from $2,700 to $11,500 depending upon pumpage rates. CUP fees vary from district to district.	Fees collected are used to partially fund the water management districts.
Iowa	Iowa Code §455B.265(6) & (IAC 567-50.4(2)“b”):	Iowa charges approximately $135 for each permitted source of water that produces more than 25,000 gallons per day. The fee changes each year as necessary to ensure that no more than $500,000/year is raised through permit fees.	The fees are based on the Department’s “reasonable cost of reviewing applications, issuing permits, ensuring compliance with the terms of the permits, and resolving water interference complaints.”

ATTACHMENT B: SUMMARY OF STATE AND INTERSTATE WATER USE FEES

JURISDICTION	STATUTE	RATE	USE OF REVENUE
Kansas	Kansas Statute Chapter 82a-951.	Assesses a $0.03 per thousand gallons “water protection fee” on public water supply systems, industrial uses, and stock watering. In addition, public water supply systems pay a “clean water protection fee” of $0.03 per thousand gallons.	Revenues are used for the protection and restoration of water resources.
Kentucky	KRS Chapter 151.723	Approximately $0.16/1000 gallons. The rate is variable and based on debt and the unique benefit that projects that were funded by that debt have on different water users within different locations of the watershed	Fund projects authorized by the General Assembly
Massachusetts	MGL 21A-18A/310CMR21 "Section 70"	Public water suppliers pay approximately $8.50 per million gallons.	The revenue partially funds regulatory activities under the Drinking Water Act
New Jersey	NJAC 7:19-3/7:19-3.6	Regulates all users of water that have the capability to divert in excess of 100,000 gallons per day. Fees range from $200 - $18000.	
	NJS 58:12A-21	Public Water System Tax - $0.01/1000 gallons	Revenue funds programs for NJ Department of Environmental Services.
Rhode Island	RI 46-15.3-5	Rhode Island has a water surcharge of $.0292/100 gallons sold by suppliers of water.	Revenue funds 1) State General Fund (57%); 2) Drinking Water Protection Fund (36.1%); and 3) Water system expenses (6.9%)
Texas	Texas Water Code Chapter 36	A [Groundwater Conservation] district may assess production fees based on the amount of water authorized by permit to be withdrawn from a well or the amount actually withdrawn. A district may assess the fees in lieu of, or in conjunction with, any taxes otherwise levied by the district. A district may use revenues generated by the fees for any lawful purpose. Production fees shall not exceed: 1. $1 per acre-foot payable annually for water used for agricultural use; or 2. $10 per acre-foot payable annually for water used for any other purpose. Thirteen districts assess the maximum rate while 11 other districts assess amounts lower than the maximum rates allowed under law.	Revenue funds the groundwater conservation districts.

ATTACHMENT B: SUMMARY OF STATE AND INTERSTATE WATER USE FEES

JURISDICTION	STATUTE	RATE	USE OF REVENUE
Minnesota	Minnesota Statute 103G.255, 103G.271	Minnesota charges the following fees for annual water use permits: 0 to 50 million gallons-$140 minimum fee;50 to 100 million gallons-$3.50 for each million;100 to 150 million gallons-$4.00 for each million;150 to 200 million gallons-$4.50 for each million;200 to 250 million gallons-$5.00 for each million;250 to 300 million gallons- $5.50 for each million;300 to 350 million gallons-$6.00 for each million;350 to 400 million gallons-$6.50 for each million;400 to 450 million gallons- $7.00 for each million;450 to 500 million gallons-$7.50 for each million;Above 500 million gallons-$8.00 for each million gallons	Funds Minnesota's Water Appropriation Program
		Maximum annual water use fees $750 for any single agricultural irrigation permit $60,000 total for an entity with 3 or less permits $90,000 total for an entity with 4 to 5 permits $300,000 total for an entity with more than 5 permits $250,000 total for a city of the first class $10,000 for a municipality that furnishes electric service and cogenerates steam for home heating. Once-through heating and cooling systems only A separate annual water use fee schedule exists for once-through heating and cooling (HVAC) systems. Non-profit corporations and school districts pay $200 per million gallons and all other entities with once-through heating and cooling systems pay $420 per million gallons. There is no maximum fee for once-through systems. Summer Surcharge A surcharge of $30 per million gallons will be applied to the volume of water used in each of the months of June, July, and August that exceeds the volume of water used in January of each year. The summer surcharge applies to municipal water use, irrigation of golf courses and landscape irrigation. This is a surcharge in addition to the regular fee rate based on the yearly total volume used.	

ATTACHMENT B: SUMMARY OF STATE AND INTERSTATE WATER USE FEES

JURISDICTION	STATUTE	RATE	USE OF REVENUE
Minnesota (continued)	Article XI of the Minnesota Constitution	33% of a 0.378% sales tax applies to a newly-created Clean Water Fund approved by voters during a general election. Tax expires after twenty-five years.	Protect, enhance, and restore water quality in lakes, rivers, streams, and groundwater, with at least 5% of the fund spent to protect drinking water sources.
	MN Statute 397A.61/Admin Rules 8130.1100	A 7% sales tax applies to water sales to certain industrial and commercial entities (see http://www.taxes.state.mn.us/taxes/sales/publications/fact_sheets_by_name/content/CM1_002928.pdf)	

Attachment F

Suggested Legislation for Private Well Sampling

HB 1685 – AS INTRODUCED

2010 SESSION

10-2935

06/04

HOUSE BILL ***1685***

STATE OF NEW HAMPSHIRE

In the Year of Our Lord Two Thousand Ten

AN ACT relative to testing the water quality of private water supply wells.

Be it Enacted by the Senate and House of Representatives in General Court convened:

1 New Chapter; Private Well Water Quality Testing. Amend RSA by inserting after chapter 485-E the following new chapter:

CHAPTER 485-F

PRIVATE WELL WATER QUALITY TESTING

485-F:1 Purpose. The purpose of this chapter is to protect public health by informing owners of private water supply wells and buyers of properties using private water supply wells, of the quality of water provided by said wells with reference to health-based standards, and to aid the scientific community in understanding the occurrence and distribution of natural contaminants in groundwater by providing a means for well owners to share well testing data with the geological survey.

485-F:2 Definitions. In this chapter:

I. “Accredited laboratory” means a laboratory accredited pursuant to RSA 485:44.

II. “Commissioner” means the commissioner of the department of environmental services.

III. “Department” means the department of environmental services.

IV. “Geological survey” means the New Hampshire geological survey.

V. “Hydrofracture” means a well development technique utilizing a high pressure pump and one or more inflatable or mechanical packers to flush out or expand fractures within a well, used to potentially increase the yield of a well.

VI. “Parameters of concern” means arsenic, bacteria (total coliform and E. coli), chloride, copper (stagnant and flushed), fluoride, gross alpha, hardness, iron, lead (stagnant and flushed), manganese, nitrate, nitrite, pH, radon, sodium, and uranium.

VII. “Private well” means a drinking water well that serves a dwelling unit and is not regulated as part of a public water system as defined in RSA 485:1-a, XV.

VIII. “Pump installer” has the meaning given in RSA 482-B:2, IV.

485-F:3 Testing of New, Deepened, and Hydrofracture Wells.

I. Upon completion of a new private well or upon deepening or hydrofracturing of an existing private well, the pump installer shall:

(a) Sample the untreated water produced by such well.

(b) Have the sample analyzed for parameters of concern, with the exception of stagnant copper and lead, by an accredited laboratory.

(c) Provide the results of such analysis to the well owner using a form developed by the department in consultation with the water well board.

II. The well owner shall acknowledge receipt of the results of such analysis by signing the form required under paragraph I(c) and returning it to the pump installer.

485-F:4 Testing of Wells Prior to Transfer of Real Estate.

I. Prior to the execution of a purchase and sale agreement for any developed

property using a private well, the seller of the property shall, at the seller’s expense:

(a) Sample the untreated water produced by such well.

(b) Have the sample analyzed for parameters of concern by an accredited laboratory.

(c) Provide the results of such analysis to the buyer using a form developed by the department in consultation with the water well board.

II. The buyer shall sign said form certifying that the seller has complied with the requirements of this section and return a signed copy to the seller.

III. If, within 3 years before the execution of a purchase and sale agreement, a private well has been tested pursuant to this chapter, the seller may provide the results of such test to the buyer to satisfy the requirements of this section.

IV. A buyer may relieve the seller of all of the requirements of this section by completing and signing a form provided by the department for this purpose. Such form shall inform the buyer of the department's recommendations regarding private well testing, and the buyer's signature on such form shall indicate that the buyer is aware of said recommendations.

485-F:5 Administrative Fines; Appeals.

I. The commissioner, after notice and hearing pursuant to RSA 541-A, may impose an administrative fine not to exceed $10,000 for each offense upon any person who knowingly:

(a) Violates any provision of this chapter or any rule or order adopted or issued under this chapter.

(b) Makes any material false statement in any document required to be filed or maintained under this chapter.

II. Rehearings and appeals from a decision of the commissioner under this section shall be in accordance with RSA 541.

III. Any administrative fine imposed under this section shall not preclude the imposition of further penalties under this chapter. The commissioner may assess additional fines upon any person who has received written notification from the department regarding violations of the provisions of this chapter or rules adopted pursuant to this chapter, if the violations have not been mitigated within 30 days of receipt of notification.

IV. Notwithstanding the provisions of RSA 21-O:7, IV, any enforcement action taken by the department or the commissioner against any licensed

pump installer pursuant to this chapter may be appealed to the water well board pursuant to RSA 482-B:16. Any enforcement action taken by the department or the commissioner against any other person pursuant to this chapter may be appealed to the water council pursuant to RSA 21-O:7, IV.

485-F:6 Private Well Testing and Notification Form. Forms developed by the department for the purposes of this chapter shall include the following information:

I. The name, mailing address, and phone number of the pump installer, if the testing is under RSA 485-F:3, or the seller if the testing is under RSA 485-F:4.

II.(a) The name and address of the owner of the well.

(b) The address of the property where the well is located in a format consistent with the state's emergency 911 system.

(c) The map and lot numbers if available.

(d) The well identification number assigned by the department, if available.

III. In the case of new, deepened, or hydrofracture wells under 485-F:3, the final well yield measured according to rules adopted by the water well board under RSA 482-B:4.

IV. The location where the sample was taken, for example the well, a pressure tank, or kitchen faucet.

V. The name, license number, if applicable, and whether the sample collector is the owner, pump installer, owner's agent, or other.

VI. The name, address, phone number, and identification number of the laboratory where the specimen was tested.

VII. Analytical results for each parameter of concern, using units specified on the form.

VIII. Explanation of analytical results relevant to drinking water standards, and explanation of well yield results relative to recommended minimum well yield for new and deepened wells, provided by the department.

IX. A statement by the laboratory agreeing to provide the following information in an electronic spreadsheet format to the geological survey within one year if so instructed in writing by the well owner or home buyer:

(a) Well location information.

(b) Well identification number assigned by the department, if available.

(c) Analytical results for each parameter of concern, using units specified by the department.

485-F:7 Voluntary Sharing of Data for Scientific Purposes.

I. Forms provided by the department for the purposes of this chapter shall include space for the well owner or home buyer to voluntarily instruct the testing laboratory to release the data listed in 485-F:6, IX to the geological survey for scientific purposes.

II. An accredited laboratory that accepts samples for analysis pursuant to this chapter shall agree to use forms provided by the department to provide information to the geological survey if so instructed in writing by the well owner or home buyer pursuant to 485-F:6, IX.

485-F:8 Rulemaking. The commissioner shall adopt rules in consultation with the water well board, pursuant to RSA 541-A, relative to:

I. The content and structure of all forms to be issued by the department, including information and other materials to be submitted with the forms.

II. Methodology for sampling water from private wells.

III. Handling of samples until delivered to the accredited laboratory.

IV. Methods and procedures to be followed by accredited laboratories to handle and analyze samples.

V. A schedule of administrative fines which may be imposed under this chapter.

VI. Procedures for notice and hearing prior to the imposition of an administrative fine.

VII. Use and sharing of private well data received by the geological survey pursuant to this chapter.

2 Effective Date.

I. The provisions of RSA 485-F:6, IX and RSA 485-F:7 as inserted by section 1 of this act shall take effect 2 years after its passage.

II. The remainder of this act shall take effect one year after its passage.

New Hampshire Private Well Working Group
Report and Recommendation to the Groundwater Commission
September 16, 2009

The Private Well Working Group was convened in October 2007 by N.H. Department of Environmental Services as part of the process of revising the department's Source Water Protection Strategy. The Working Group includes a member of the SB 155 Groundwater Commission, and the Commission has expressed interest in private well questions under Issue 5, Protecting Groundwater Quality to Ensure Availability. Therefore, the recommendation in this document is directed to the Groundwater Commission, since it involves legislative changes.

The Private Well Issue

The purpose of New Hampshire's Safe Drinking Water Act is "to provide a comprehensive drinking water protection program for the citizens of New Hampshire." However, at present the statute deals only with the oversight of *public* water systems. Approximately 40 percent of New Hampshire residents rely on private wells for domestic water supply. If the water from these wells is not tested and properly treated, private wells represent a risk to public health. An estimated 20 percent of wells in the state have arsenic above the drinking water standard; in some areas it is as high as one in two wells. An estimated 33 percent of wells statewide exceed the proposed federal standard for radon, and smaller percentages exceed other health-based drinking water standards, which apply to public water systems but not to private wells.[1] Without testing for the appropriate parameters, homeowners are unable to make informed decisions about consuming water from their private wells. Approximately three percent of newly drilled wells also have insufficient yield to support normal household use. Experience in the sanitation field indicates that inadequate water supply is a health concern, since the use of alternate water supplies often involves the transport of water in containers that carry a risk of introducing microbial contaminants.

[1] For further explanation, please see Private Well Working Group White Paper, rev. August 2009 and Estimated Percentages of Private Water Supply Wells Exceeding Contaminant Limits, rev. 7/15/2009

The Process

The Working Group met twice, in October 2007 and March 2008. At its first meeting the Working Group reviewed the nature of the problem (40 percent of N.H. residents using private wells; 20 percent of those with arsenic exceeding the drinking water standard; many others with radon issues), existing programs (Water Well Board, Private Well Initiative outreach, Plumbing Code, the handful of towns with private well testing requirements), issues with the household water treatment industry, and the DES private well testing recommendations incorporated into its outreach materials. The consensus from that meeting was that there is a need to better address the public health issue and that a white paper would be helpful to document the problem(s) and to identify and analyze the policy options.

The white paper, completed in February 2008, was the focus of discussion at the second meeting of the Working Group on March 19, 2008. The white paper summarized the background information including existing programs and gaps, and described seven policy options. **At that meeting, a majority of Working Group members voted to adopt policy option B, requiring testing and disclosure to a prospective buyer at real estate transfer**. Testing would be modeled after the DES Laboratory's Standard Analysis plus radon and gross alpha, which together cost $165 at the DES Lab ($174 - $240 at private labs); VOC and/or beryllium testing would be *recommended* under certain circumstances. Disclosure of available well yield information would also be required. Two people were opposed to mandatory testing and disclosure: representatives of the Home Builders and Remodelers Association (NHHBRA) and the N.H. Association of Realtors (NHAR). Their objections: it would slow real estate transactions, would hurt home sellers, and would not benefit public health because home buyers tend to pocket any reduction in price negotiated on the basis of an unfavorable water test, rather than installing treatment.

The second major policy option discussed at the March 19, 2008 Working Group meeting was a **testing requirement for new drinking water wells**. There was general support for this idea (with the exception of the HBRANH representative; the Realtor was not present), but the well drillers representatives asked to delay a

vote until this had been discussed with the Water Well Board and the Water Well Association.

Since the second meeting of the Working Group, the Water Well Board and the Water Well Association met and were generally supportive of a testing requirement for new wells, but they have a number of concerns that would need to be addressed when and if legislation were to be crafted (see Remaining Issues).

Finally, drafts of this document, the white paper, and supporting documents were circulated during May and June of 2009 among Working Group members, and revisions were made to reflect the sense of the Working Group and to clarify certain background information. The revised documents (this document, the white paper, and others) were circulated among Working Group members once more during June-July 2009 before being finalized.

Recommendations

After careful study, the Private Well Working Group recommends that the legislature amend the Safe Drinking Water Act to require testing of water supplied by ***new*** *private water supply wells (in connection with the drilling of new wells and the deepening of existing wells).*

A majority of the Working Group's members also recommend that the testing of private wells and disclosure of test results be required prior to the transfer of real estate. Disclosure should also include available well yield information. The N.H. Association of Realtors and the Home Builders and Remodelers Association of N.H. both object to this recommendation, due to their concerns about the effect such a requirement would have on the process of closing home sales, although they do support the overall goal of ensuring safe drinking water for users of private wells. (Please see attached letters.)

Remaining Issues

A number of issues remain that would need to be addressed if the Groundwater Commission were to move ahead with crafting legislation to implement the Working Group's recommendation:

- A number of working group members support a requirement that private well testing data be reported to a state agency. This would greatly improve understanding of the geographic distribution of bedrock well water quality in New Hampshire but would require personnel and resources to implement. A suggestion was also made to designate a voluntary organization to maintain such a database.
- A number of working group members felt that testing and disclosure alone would not be sufficiently protective of public health, and favor some requirement to treat water where indicated, in order to address some or all contaminants of concern.
- Who should be responsible for taking water samples and bringing them to a laboratory, while (1) ensuring the integrity of the testing and disclosure process and (2) avoiding unnecessary delays in the process of obtaining a certificate of occupancy (CO) where the municipality chooses to take the test results into account in the issuance of a CO?
- Determining an appropriate sampling point, e.g., after the pressure tank.
- The health-based standards for radon are confusing, and better materials would need to be developed to help homeowners make sense of water test results.
- Should the private well testing requirement include additional water quality parameters whose bearing on health are secondary in nature but provide scientific information regarding the occurrence, fate, and transport of other more dangerous natural contaminants?
- How to ensure that well testing results are conveyed to the homeowner or prospective home buyer in a way that makes it clear that the well driller is not responsible for groundwater quality.
- Possible requirements for retesting in the event that bacteria is detected.
- Whether to address the vagueness of the Plumbing Code with respect to water quality. The Plumbing Code states that only potable water sources may be connected to domestic plumbing systems. "Potable" is defined in the Code with reference to "regulations of the public health authority having jurisdiction." The sense among the Working Group is that defining “potable” in terms of specific contaminants and contaminant limits would create a testing requirement for new wells and also create a *treatment requirement* for new wells whose raw water did not meet the standards. The Plumbing Code could be a useful avenue for a testing and disclosure requirement for new

wells (although not by defining "potable"), but the Working Group felt that a clear legislative mandate would be appropriate.

Respectfully submitted,

Paul Susca
NHDES Drinking Water and Groundwater Bureau
for the Private Well Working Group

Members of the Private Well Working Group

Name	Affiliation
Joseph Ayotte	US Geological Survey
Patricia Bickford	NHDES Laboratory
Christine Bowman	NHDES-Drinking Water Source Protection Program
Bruce Buttrick	Code Enf. Officer/Building Inspector, Town of Bow
Kendall Buck	Home Builders and Remodelers Assoc. of N.H.
Bart Cushing	N.H. Water Well Board
Patricia Debeer	Fremont Conservation Commission
Tedd Evans	N.H. Plumbing Board
Sherry Godlewski	NHDES Environmental Health Program
Glenn Greenwood	Rockingham Planning Commission
Louise Merchant Hannan	NHDHHS Health Officer Liaison
Eugene Heighton	HERTC
Tal Hubbard	NHDES Waste Division
Brandon Kernen	NHDES-Drinking Water Source Protection Program
Brian Lockard	Health Officer Association
Bernie Lucey	NHDES Drinking Water and Groundwater Bureau
Paul Morin	Home Builders & Remodelers Association of NH
Jack Munn	Southern NH Regional Planning Commission
Julia Peterson	N.H. Sea Grant and UNH Cooperative Extension
Bob Quinn	N.H. Association of Realtors
Keith Robinson	US Geological Survey
Rick Schofield	Water Well Board
Roger Skillings	Skillings & Sons
Paul Sullivan	Home Builders and Remodelers Assoc. of N.H.
Paul Susca	NHDES-Drinking Water Source Protection Program
Terry Swain	Capital Well Co., Inc.
David Wunsch	N.H. Geological Survey

August 21, 2009

Paul Susca
Drinking Water and Groundwater Bureau
NH Department of Environmental Services
Hazen Drive
Concord, NH 03301

Dear Paul,

As a participant in N.H. Private Well Working Group(PWWG), the New Hampshire Association of REALTORS has concerns with the final recommendations which would require testing of wells prior to the transfer of real estate.

While the NHAR supports the overall goal of ensuring safe drinking water to homeowners who rely on well water, the point-of-sale mandate is not clearly defined and could lead to unnecessary and costly delays in the transfer of property. Any proposed legislative efforts are premature until details of the testing process are clarified and demonstrated to have a negligible impact on the right of homeowners to transfer property.

The NH Association of REALTORS commends you and all the members of the PWWG for your diligence and commitment to ensuring safe drinking water to homeowners.

Best regards,

Jeff Keeler

NH Association of REALTORS
Chair, Public Policy Committee

Home Builders & Remodelers Association of New Hampshire
"Building New Hampshire's Future"
The Housing Center • 119 Airport Road • Concord, New Hampshire 03301
603-228-0351 • F: 603-228-1877 • E: info@hbranh.com • W: www.hbranh.com

September 10, 2009

Paul A. Susca
NHDES Drinking Water and Groundwater Bureau
Hazen Drive
Concord, NH 03301

Mr. Susca,

The Home Builders and Remodelers Association of New Hampshire was pleased to participate in the Private Well Working Group and support the effort for a comprehensive drinking water protection program. We must, however, concur with the New Hampshire Association of REALTORS and object to the recommendation to require testing and disclosure to all potential buyers prior to any real estate transfer that involves a private well.

The Association encourages all home builders to test and disclose water quality in new wells to potential buyers and custom home clients and does not object to recommendations to the NH Legislature to consider the requirement of testing certain parameters of such wells. Naturally, that endorsement is dependent upon which parameters are to be tested and what, if any, consequences may ensue.

Our concerns for the testing of existing wells, as recommended in the report draft, are for the chilling effect that it may cause on the closing of home sales which are often an integral part of the new home buying process and the shift of responsibility to the seller that is normally born by the buyer as part of his/her due diligence.

We appreciate the efforts of the Private Well Working Group and particularly your dedication to including all points of view in the work product. We hope that our support of the overall effort and our objection to this particular recommendation will be noted in the final version of the document.

Sincerely yours,

Mark A. Pederzini

Mark Pederzini, GMB, CAPS, CGB, CGP
President

Attachment G
Groundwater Data Needs

SB 155 – Commission to Study Issues Relative to Groundwater Withdrawals

Subcommittee Report

Issue No. 6:

Groundwater Management Data Needs

July 19, 2010

Table of Contents

Appendices

Introduction

In December 2005, the legislative Commission to Study Issues Related to Groundwater Withdrawals [the Groundwater Commission] developed a list of key issues that the commission needed to address in order to meet its statutory mandate. Under each issue, the commission formed a suite of questions that, when answered, would adequately frame future legislative actions needed to address issue-specific deficiencies that relate to proactively managing the state's groundwater resource to the benefit of all of its citizens.

This report presents the findings and results of a subcommittee formed to address the Groundwater Commission's Issue No. 6, titled *Groundwater Management Data Needs*. The charge of the Issue No. 6 'Data Needs' subcommittee was to address the following questions:

1. *Identify and review statewide summaries of current data and data needs analysis and review the Seacoast Groundwater Availability Study.*
2. *What data is needed to effectively manage groundwater resources? Do we have it? If not, how do we obtain it?*
3. *Is the existing monitoring net work consisting of 26 overburden wells and 13 bedrock wells measured monthly for water level data sufficient? If not, why?*
4. *Is there a need for ambient groundwater quality data?*
5. *Should the current stream gage network be maintained and or expanded? How should stream gauging be funded and who should complete the work?*
6. *Is there a need to link water quality data to location and, if so, is well tagging the way to do it?*

In developing answers to the questions posed above, the subcommittee solicited input from a variety of stakeholders through circulation of a questionnaire relating to the use of existing groundwater data as well as other related needs, development and distribution of a draft report to upgrade the groundwater level monitoring network in the state, and a stakeholder meeting held to garner input on the network plan proposed in the draft report and other groundwater-related issues. Hence, the responses below and the findings of this report were derived through input from public water suppliers, business and industry representatives, local government officials, academics, consultants, and state/federal representatives, and generally represent the consensus of opinion of subcommittee participants. Appendix A provides an Executive Summary of the stakeholder input received as part of this process.

To note, the section below provides the subcommittee's responses to the Issue No. 6 questions posed by the full SB155 Groundwater Commission. Although the responses below contain or refer to relatively specific information or data, the subcommittee acknowledges that there exists a substantial range of information and opinion on many of

the topics and data needs discussed, and other interpretations of the type and quantity of information that is most pertinent to the specific question being responded to are possible.

Subcommittee Responses to Issue No. 6 Questions

Question 1. Identify and review statewide summaries of current data and data needs analysis and review the Seacoast Groundwater Availability Study.

Statewide Data Summaries

Currently, various entities collect, process and manage statewide data relating directly to groundwater, or other water resource information indirectly related to groundwater. The two lead entities in these efforts are the New Hampshire Department of Environmental Services [NHDES] and the Unites State Geological Survey [USGS] NH-VT office. The information garnered by these two agencies is generally made available to the public through the internet. Although this report does not present an exhaustive list of all statewide data summaries or data collection tasks, as examples, NHDES (largely through the New Hampshire Geological Survey [NHGS] and the Drinking Water and Groundwater Bureau [DWGB]) conducts various activities that include:

- Collecting and storing groundwater well construction data;
- Conducting hydrogeologic unit field mapping projects and producing geologic maps;
- Storing groundwater quality data for community water supply wells and private wells;
- Operating numerous dams, and acquiring associated streamflow and climate data;
- Collecting water use data and implementing the water use registration and reporting program;
- Overseeing and implementing the water conservation program; and
- Operating the current groundwater level monitoring network.

USGS-related activities include:

- Operating and maintaining numerous stream gage stations;
- Warehousing and processing stream gage data;
- Warehousing and processing groundwater level data;
- Performing case-specific research projects related to groundwater quality/quantity; and
- Conducting research and publishing reports on water use, water level, and streamflow trends across the state.

Other entities that collect groundwater related information are various universities, the state climatologist office, National Oceanic and Atmospheric Association [NOAA], US Forest Service, private consultants, and various municipalities and public water systems. Information and data collected by these entities are generally available through their associated data warehouses (e.g. National Climate Data Center [NCDC]), scientific publications, or public health brochures, notices or various internet sites.

Summary of Data Needs Analysis

SB162 (2003) established a standing Water Resources Committee under RSA 481:1-b to study water resource related issues and report, annually, on the future water needs of the state. In 2005, the SB162 committee directed NHDES to evaluate such needs and provide a summary to the committee; subsequently, on December 7, 2005, the SB 162 committee published the report titled *Summary of Information Needs for Effective Water Management in NH* that was prepared by NHDES in cooperation with USGS, NHGS and a UNH professor. This summary report stands as one of the more comprehensive, broad ranging water-related data needs assessments conducted to date, and it identified and prioritized 13 critical water-related data needs in the state (not specifically limited to groundwater). Appendix B provides a summary table of the data needs identified by the SB162 committee, a brief description of each need, and a review of items and activities completed or in-progress for the needs identified by the committee.

A more narrowly focused data needs summary was released by NHDES' Watershed Bureau [in draft] in September 2005 and was titled *Water Monitoring Strategy*. The focus of the strategy report was to develop a body of goals, objectives and priorities on a watershed basis pertaining to improving the monitoring of and data collection efforts specifically for surface water bodies in the state. The related information collected under the strategy would be used to assess and identify impaired waters, unify evaluation techniques, and inform policy makers on the action needed to improve statewide surface water quality and resources. The draft strategy report can be found at http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/r-wd-05-27.pdf . The status of some of the actions taken to meet the objectives of the strategy are recorded on the SB162 summary table included in this report.

Seacoast Groundwater Availability Study

The USGS completed its study of groundwater availability in the seacoast region of the state and published two reports titled *Methods for and Estimates of 2003 and Projected Water Use in the Seacoast Region, Southeastern New Hampshire* [SIR 2007-5157] and *Assessment of Ground-Water Resources in the Seacoast Region of New Hampshire* [SIR 2008-5222]. These studies marshaled resources by numerous agencies and provided estimates of current and projected water use trends across the southeast portion of the state, and developed a groundwater model of the seacoast community to simulate the potential effects of increased population growth, the related increase in water use and water-infrastructure expansion, and the effects of climate change. In general, model predictions imply that these stresses may result in lowering of regional groundwater levels to varying extents, as well as reduced stream base flow and fresh-groundwater discharge to tidal areas. The effects of development of a regional sewer system were also specifically evaluated and rendered generally similar conclusions to the environmental stresses that were simulated. The full USGS reports can be found at http://pubs.usgs.gov.

Question 2. What data is needed to effectively manage groundwater resources? Do we have it? If not, how do we obtain it?

The data needs that would assist in groundwater management efforts across the state are diverse, and sufficiently addressing these needs would substantially affect the public health, welfare and private interests. Currently, New Hampshire is groundwater data-poor in that there has been a long-standing, recognized need to expand the state's capacity to collect, process and distribute data related to direct measurements of groundwater quantity and quality, and other hydrologic parameters that indirectly speak to groundwater availability. To date, expansion of the database of information has been constrained by the limited resources that the state has dedicated to such purposes.

Generally, the data needed to effectively manage groundwater resources in the state are those that directly provide for an estimate of water entering [input], water exiting [export] and water stored within the groundwater system, as well as those parameters that govern these processes. Ideally, the data record for the parameters measured should be maintained over time in order to monitor for trends related to long-term changes in hydrologic stresses, and to assess the effects of policy shifts in resource management and groundwater use into the future.

Tracking of available input into the groundwater system is accomplished through measurement of precipitation (both rainfall and snow) across the state. Statewide exports from the system are chiefly dictated by direct precipitation loss through evaporation and plant uptake [evapotranspiration], sheet flow or run off from impervious surfaces (to a point of discharge), baseflow discharge to streams/rivers or tidal areas with ultimate discharge to the ocean, and consumptive water use. The amount of water available in storage within hydrostratigraphic units is defined by both groundwater levels and the physical characteristics of aquifer materials. The 'data needs' that expressly address measuring inputs, exports, and assessing availability of water in storage include:

- *Groundwater Levels*: A representative spatial density of high resolution groundwater level data speaks directly to the volume of water available in storage over time, and changes in groundwater levels (both over the short and long term) are a direct result of changes in the hydrologic stresses that govern the input and export of water.

- *Geologic Unit Field Mapping*: Mapping the distribution and characteristics of various geologic and hydrostratigraphic units and features provides a substantial basis for assessing groundwater development potential, likely areas of groundwater recharge, and regions that present a higher potential for naturally occurring contamination. Appendix C presents further detail on this issue.

- *Meteorological Monitoring*: Collecting a high resolution of measurements of rain/snow fall, temperature, humidity, etc. across the state's hydro-climatic zones relates directly to the volume of water that is potentially available as groundwater recharge for hydrostratigraphic units.

- *Water withdrawal, discharge and transfer tracking*: Identifying the location, tracking the volumes, and enhancing the data quality from registered water uses in the state greatly assists in building regional to local water budgets and otherwise identifying potential stressed areas.

- *Photogrammetry and other remote sensing data* (e.g. LIDAR [Light Detection and Ranging] mapping, false color imagery, stereoscopy, etc.): Imaging and remote sensed data provides a tool to assess changes in land use patterns and development that dictate locally relevant areas where groundwater recharge is intercepted; and greatly resolves topographic and other features responsible for establishing hydrologic drainage patterns at the land surface and/or features that may act as conduits for more regional patterns of groundwater flow.

- *Streamflow measurements*: Base flow in streams and rivers at times of year when plant uptake and evaporation are highest is generally interpreted as representative of the volume of available groundwater recharge. Tracking an adequately distributed network of stream gage records therefore serves as an 'aggregate' signal of potential hydrologic stresses across, and between, individual drainage basins.

- *Groundwater Quality*: The chemical signature of groundwater directly relates to its suitability of use for various purposes, the most stringent of which is human consumption. Increasing the amount and spatial resolution of statewide water quality data will assist both public and private interests in gauging the adequacy of groundwater for various needs and assessing trends in water quality over time.

To varying degrees numerous state and federal entities collect some data referenced above, including: NHDES; NHGS; USGS; National Weather Service [NWS-NOAA]; United States Department of Agriculture [USDA]; and National Aerial Photography Program [NAPP]. Other agencies may also perform monitoring and data collection related to inputs and exports of water, yet their collection efforts are not normally as broad in scope as those agencies listed above.

In the context of water use, the importance of groundwater has increased substantially over the last 20 years in the state, in concert with increases in population and residential density. Of particular relevance is that groundwater surpasses surface water as a source for drinking water for the majority of state residents, and private groundwater supply wells, in particular, represent the largest body of groundwater users in the state. Figure 1., below, provides the relative distribution of water sources in the state.

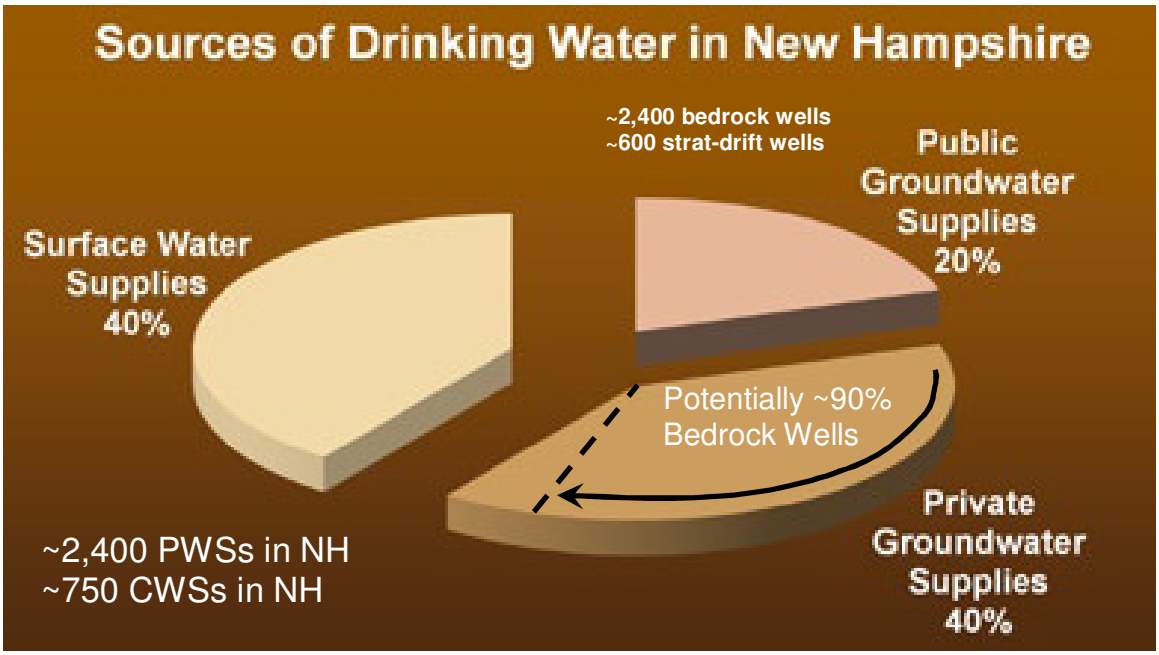


Figure 1. Relative estimate of water source type in NH.
(From: The NH Water Resources Primer, 2008).

Consequently, the increase in emphasis and demands on groundwater as the primary source of water for the state has fueled further review of the existing and limited body of groundwater related data by various agencies. The focus of most of these efforts have been to glean information from available data that indirectly infers where use of groundwater may exceed available recharge and attempt to identify potential trends and areas of either current or near-future stress.

Figures 2. and 3.below present an example of an evaluation of indirect data from the well completion records submitted to NHGS by licensed well drillers. The state's database of well completion records has been compiled since 1984 and maintains over 100,000 entries, where approximately 50% of the wells in the database have been geo-located. Note that the well database itself, also, does not represent all wells drilled in the state. The evaluation depicted in Figures 2 and 3 attempts to identify areas where there are proportionally higher density 'clusters' of wells, and then cross-correlate those areas with annotations on the well driller's records that indicate a well has either been deepened or replaced due to limited yield or low water levels.

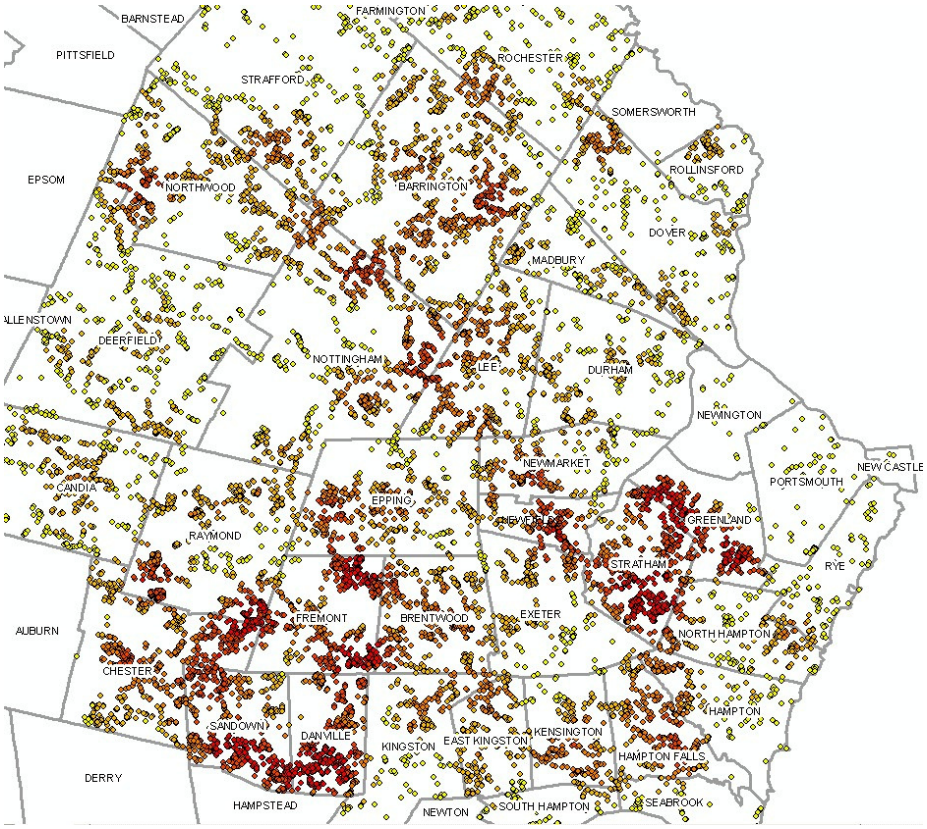


Figure 2. Point locations for geo-located well completion records in select NH Coastal communities. Red indicates proportionally higher density well clusters, yellow indicates lower density areas. (Derek Bennett, NHDES, written communication)

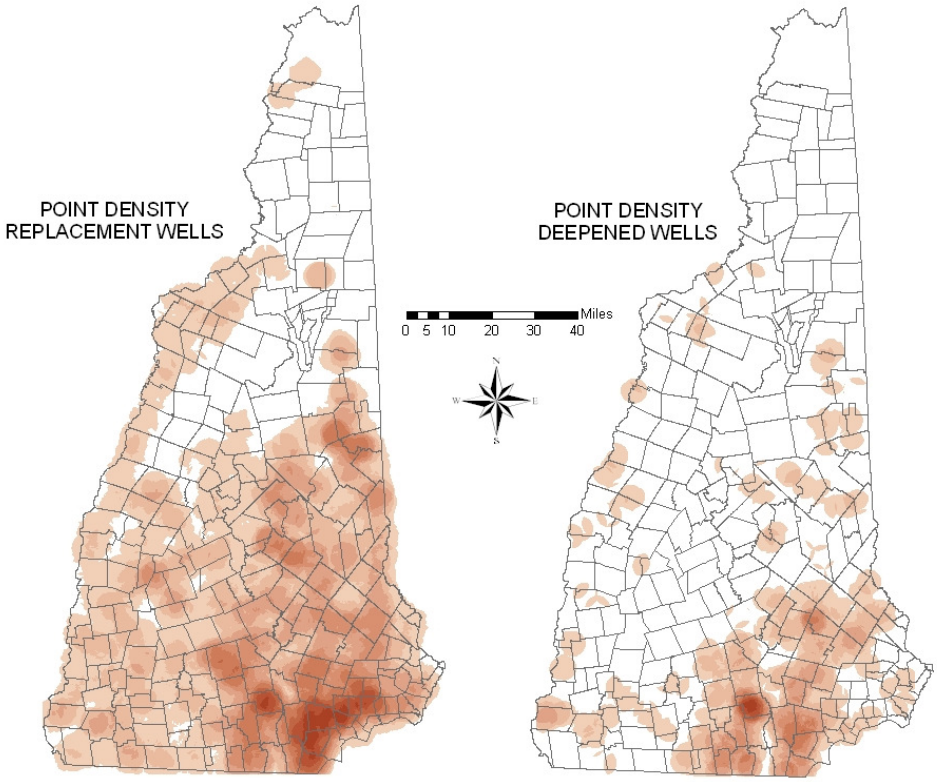


Figure 3. Shaded density point plot of replaced or deepened wells based on well completion record type field on record filed with NHGS.
(Brandon Kernen, NHDES, written communication)

Current well completion records submitted to NHGS also commonly provide a one-time static water level for each well installed. Generally, however, the value is recorded by the driller that installed the well either one the day of, or very soon after completion of well drilling and may be more than minimally influenced by the drilling activity itself. Figure 4 presents an approximate 24-year trend of static water levels from those records, and implies a general downward trend of groundwater levels over time. Although potentially of marginal quality, the quantity of data is large and significant (~24,000^{+} records).

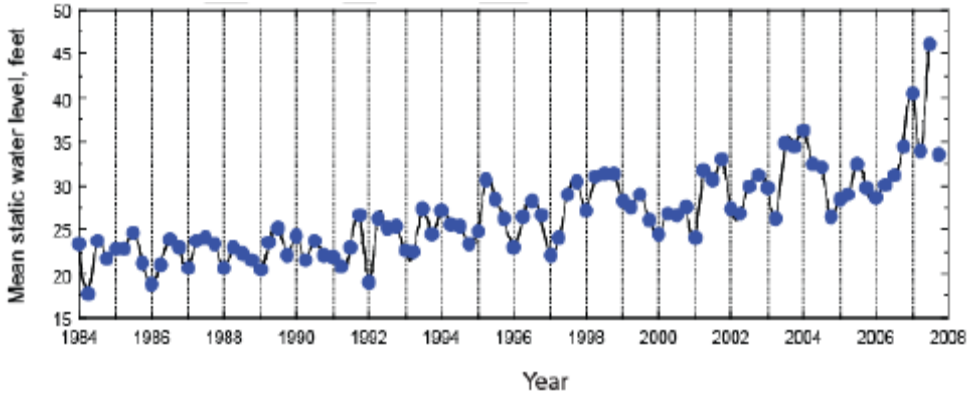


Figure 4. Mean seasonal static water level (depth) from 1984 through 2008 [n>24,000].
(Joe Ayotte, USGS, written communication)

Public domain geographic information system (GIS) datalayers pertaining to land use, topography and hydrography; US census data; USGS water use estimates; stream gage records; well records; and the state's database of registered water users were collectively leveraged by NHGS to develop and complete a 'Stressed Basins' model of the Piscataqua River watershed. In essence, the model effectively assesses the degree of stress to the quantity of water available to individual basins in the modeled area by comparing total water withdrawals to estimated summer stream flows. The resultant index of stressed areas are those that may not have sufficient recharge (either directly to the basin or from inflow) to support current withdrawals. Figure 5. below depicts results of the stressed basin model for the river basin in the state's coastal community.

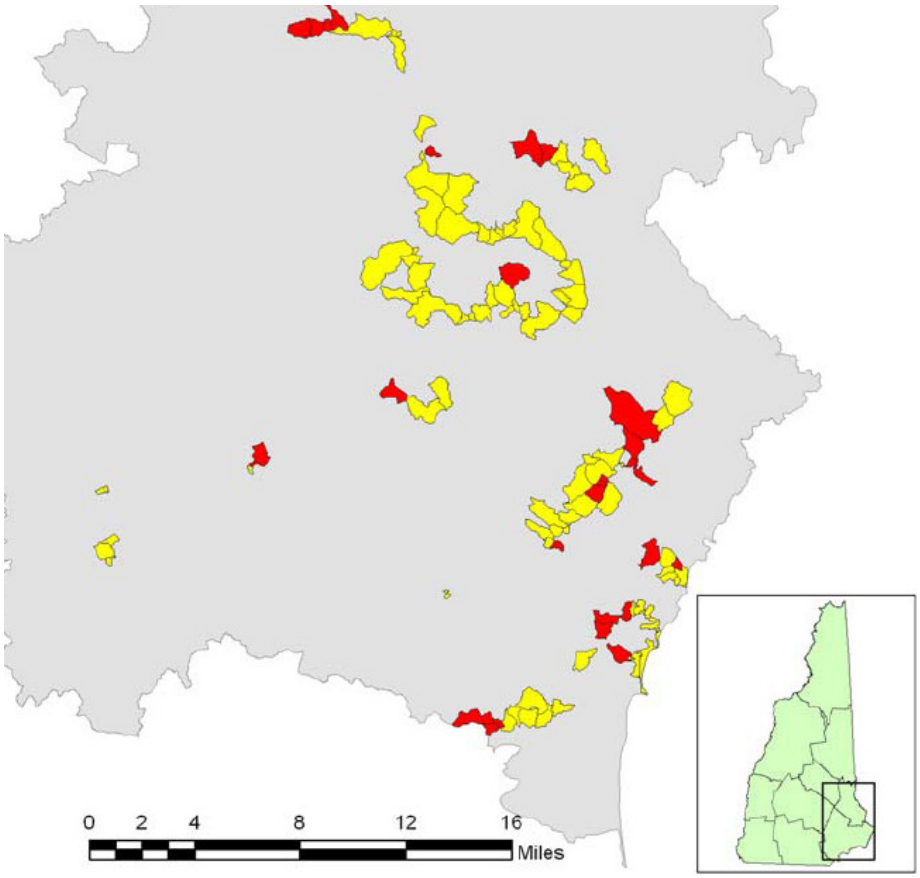
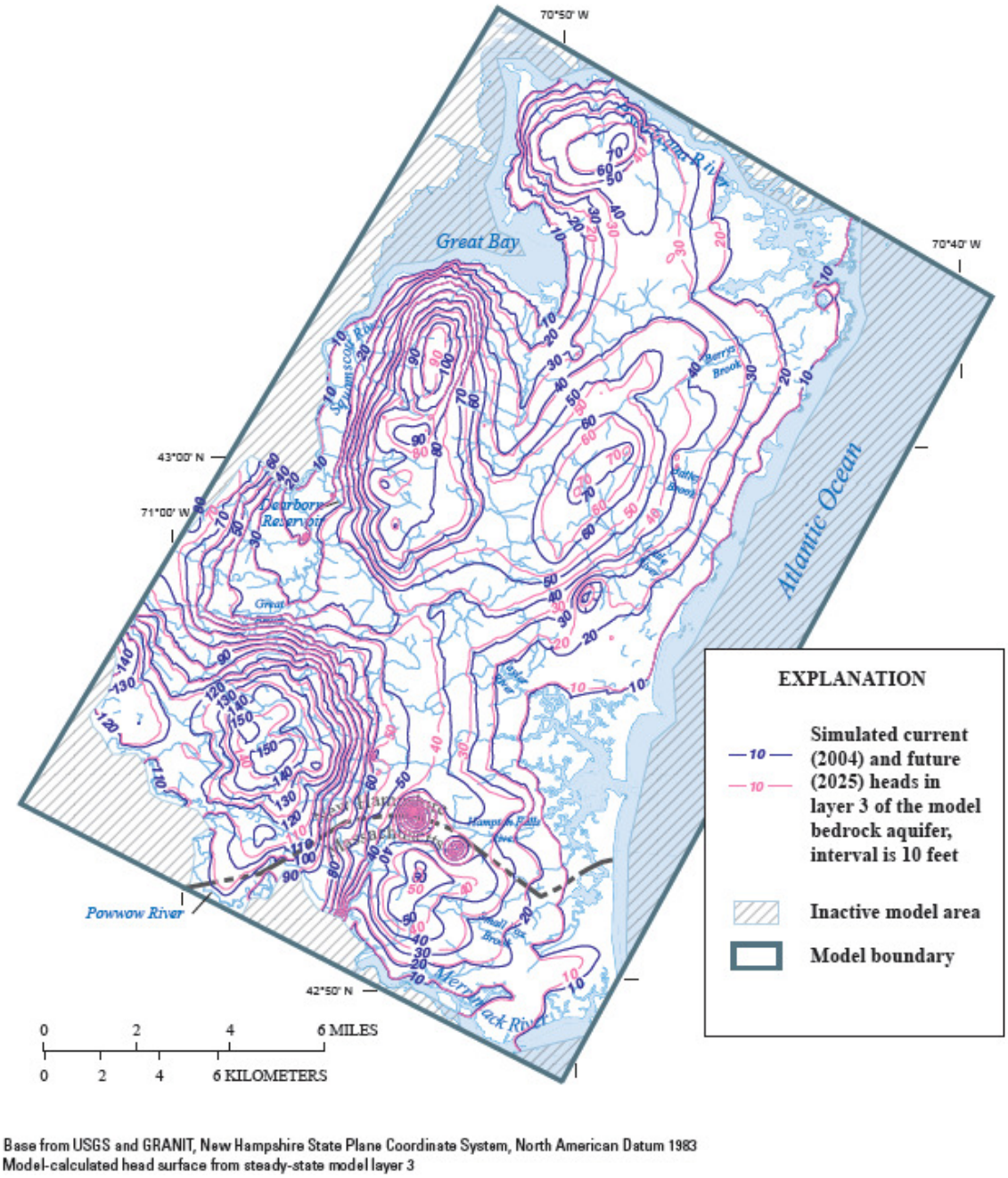


Figure 5. Results of NHGS Stressed Basin model for Piscataqua River basin, deeper colors indicated most stressed basins. (From: NHGS Stressed Basins website at http://des.nh.gov/organization/commissioner/gsu/nhhdp/stressed_basins.htm)

USGS developed a numerical groundwater flow model for a 160 square mile area of NH coastal communities that, itself, constituted compilation of well records, additional geologic mapping and coordination with both public and private entities to collect records of groundwater levels over time. The compendium of information, once compiled into numerical model parameters, were used to simulate groundwater levels in the area for past and potential future conditions under various hydrologic stresses and possible regional population growth scenarios. Figure 6 below depicts the results of one such

simulation that assesses the potential effects of climate change on groundwater levels near the seacoast for an approximate 15-year simulation horizon. In general, the figure indicates a broad range of potential groundwater declines in the area resulting from climate change, a condition along the seacoast that may have long-term implications on the potential for seawater intrusion in those areas.



Base from USGS and GRANIT, New Hampshire State Plane Coordinate System, North American Datum 1983
Model-calculated head surface from steady-state model layer 3

Figure 6. Simulated hydraulic heads based on projected climate change simulated for the Seacoast model areas for the years 2004 and 2025.
(From: Mack, T.J., 2009, Assessment of ground- water resources in the Seacoast region of New Hampshire: U.S. Geological Survey Scientific Investigations Report 2008-5222, 188 p, Figure 20)

Although not a complete list, the examples described above demonstrate that much effort has focused on using available data and indirectly assessing the availability and/or sustainability of groundwater resources to support current and future water needs. Overall, the general conclusion from much of that work has reflected the potential for stress on the resource that is likely to substantially grow in the future. The conclusions drawn from the studies performed, however, are conditioned on the fact that they collectively rely heavily on inferential data and statistics as compared to more direct measurements and long term data records of groundwater conditions and use, and would substantially benefit from a data record that represents actual conditions of the groundwater resource.

In light of the information above and input received from stakeholders, the subcommittee recommends that the state's groundwater level monitoring network be expanded as a means to more effectively manage groundwater in the state, and ensure its sustainable use. The volume of water available in storage is directly measured through observation of groundwater levels in water bearing formations, and the effects of changes in water input or exports are realized through observed changes in groundwater levels over time. Consequently, observing and tracking groundwater levels is a fundamental mechanism in adequately assessing the influence of various stresses on the resource (e.g. climate, extraction, land use change), and speaks directly to the issues of resource availability, and sustainable use practices and strategies. Of particular value is a groundwater level monitoring network that targets areas of high potential stress, and one that is designed to work in conjunction with other data collection networks that measure various parameters of the hydrologic system. Therefore, Appendix D provides a plan and implementation strategy developed by the subcommittee to expand the state's groundwater level monitoring network that better positions the state to adequately respond to groundwater related issues that may affect the water supply of its residents into the future.

Question 3. Is the existing monitoring network consisting of 26 overburden wells and 13 bedrock wells measured monthly for water level data sufficient? If not, why?

The groundwater level monitoring done through the existing network is not sufficient in addressing the issue of groundwater resource availability or sustainability in the context of tracking patterns of higher intensity groundwater use across the state (see the discussion above and the groundwater level network development plan contained Appendix D). The current network was largely developed through acquisition of wells formerly used by USGS during a statewide effort to map saturated sand & gravel deposits that are estimated to cover approximately 15% of the state's land area. Since inception, the network has received relatively little attention from legislative driven efforts to establish additional funding for data collection, maintenance or upkeep. These efforts, to-date, have largely been borne through related staff and program funding by NHGS. Overall, being designed around an overburden mapping project, the network tends to under-represent high intensity groundwater use areas and groundwater levels within shallow fractured bedrock. As such, it does not provide a sufficient resolution of data to make timely decisions about resource availability in times of scarcity within the fractured bedrock that provide a substantial volume of groundwater to state residents. Recent

efforts to expand the number of bedrock wells within the network improves the representativeness of groundwater uses in the state; however, due to the size of the appropriation for this effort, the number of bedrock wells added to the network is relatively small, and in need of expansion to be more representative of the pattern of groundwater use in the state. The plan contained in this report therefore proposes to upgrade and expand the existing groundwater level monitoring network, and establish a network design that is better positioned to address these important issues.

Question 4. Is there a need for ambient groundwater quality data?

In reference to the public health, ambient groundwater quality data is valuable in that it can help in identifying the patterns and distribution of areas in the state with high concentrations of naturally occurring groundwater contaminants (e.g. uranium, radon, arsenic, fluoride, etc.). Such data would help target health advisories and other related public outreach efforts and education, and allow for more efficient use of the resources that are dedicated to those efforts. Currently, NHDES' DWGB administers the State's Safe Drinking Water Act [SDWA] which establishes the requirement for review and approval of all public water systems in the state, and ensure that water systems that provide water for drinking water purposes continually monitor water quality and provide treatment for drinking water that does not meet federal drinking water standards. Further, the DWGB, in conjunction with the state health laboratory, has also developed a private well sampling outreach initiative (see http://des.nh.gov/organization/divisions/water/dwgb/well_testing/index.htm) which provides private well owners with water quality guidance documents, contact information for water quality results or treatment-related information, well maintenance tips, consumer guides, contact information for analytical laboratories, and other resources.

Ambient groundwater quality data, itself, however, speaks more to the issue of suitability of groundwater for the use of direct consumption by humans (without treatment), and does not speak directly to the issues of groundwater availability or sustainability of use within a limited area or over a broader region. Therefore, although valuable for matters of potential public health impacts, it is of limited to little value in assessing the long-term availability/sustainability of the resource. As such, the groundwater level monitoring network plan presented in Appendix D, identifies groundwater quality sampling as a secondary network priority.

Some available avenues for existing and ongoing groundwater quality data were identified by subcommittee members as being potentially available with minimal expenditure of resources, they include:

- Review of compliance water quality data for those public water systems that use groundwater as their primary water source and do not provide treatment of the water before delivery to consumers.

- Enabling private well owners to voluntarily submit their water quality data collected from their primary residence for incorporation into a statewide database for follow-on scientific study.

- Establishing a modest annual appropriation within a the operation and maintenance budget of the groundwater level monitoring network to collect groundwater quality samples from either network wells or public water system wells on a three to five year schedule.

Question 5. Should the current stream gage network be maintained and or expanded? How should stream gauging be funded and who should complete the work?

In response to declining numbers of active stream gages in NH since 1969, in March 2006, NHDES formed the Stream Gage Task Force [SGTF] to: assess the current condition of the state's stream gage network; develop recommendations to meet unmet gauging needs; propose a recovery plan for gage network stations; and identify an indelible funding source for long-term operation and maintenance of the network and any recovered/new gages. The SGTF published its report titled *A strategy to implement and fund a long-term, multi-purpose New Hampshire Stream Gage Network* on September 15, 2006. The report can be found at http://des.nh.gov/organization/divisions/water/wmb/rivers/rmac/nh_sgtf.htm .

In summary, the SGTF developed a prioritized plan to a:) maintain the existing gage network (including those gages scheduled for closure), and b:) add gages in up to 35 watersheds in the state (17 of which were identified as the highest priority). Although the SGTF concluded that there was need to establish a stable funding source for network operation and maintenance, no specific funding source was identified by SGTF stakeholders.

Since publication of the SGTF report, 15 stream gages in SGTF-identified priority watersheds were either reactivated or constructed using a one-time capital budget appropriation of $100,000 in 2007 that was augmented with a matching grant of $86,000 obtained by NHDES. This funding also supported operation and maintenance of the same 15 gages through September 2009. Following September 2009, an annual general fund appropriation of $15,000 per gage for each of the 15 gages was established to support ongoing gage operation and maintenance (annual total ~$225,000). This appropriation is made to NHDES' Dam Bureau; the Dam Bureau, in turn, allocates these funds under contract to USGS for gage operation and maintenance services, as well as data processing.

Based on the summary above, although some of the SGTF recommended priorities have been met, some gage priorities remain unfulfilled, and the need to establish a more stable funding source continues.

Question 6. Is there a need to link water quality data to location and, if so, is well tagging the way to do it?

Data and information on groundwater quality that is linked to a specific location is a useful tool in evaluating the distribution of constituents in groundwater (both naturally occurring and manmade) that may impact the public health [see response to No. 4 above]. In order to best serve the greater public health, there is need to link water quality to location.

Linking of water quality to a specific location requires that a well be adequately located, and that a well have a unique identifier that can be used by the current (and future) well owner. In 2007, the groundwater commission recognized the utility of establishing a requirement for a unique well identification (e.g. well tag) for all new wells drilled in the state and developed bill language [HB 459] to require that licensed drillers be required to install such a tag upon construction of a new well. The proposed bill language was strongly opposed by the drilling industry licensed in the state however and the language of HB 459 was changed to require a driller to submit a new well's location using global position system (GPS) technology, street address, and tax map and lot. The exactness of these location techniques vary but are generally suitable to assign a well to a specific point location with a reasonable degree of accuracy. Provided that well owners (current or future) establish and identify the address or tax map/lot with any groundwater quality samples collected, water quality data should be able to be assigned to its appropriate source location. Further work, however, needs to be completed to enable private well owners to voluntarily provide water quality data for their individual wells to a central water quality database maintained by NHDES (see response to Question 4 above).

Summary

As stated in the response to Question No. 2 above, in consideration of input from stakeholders and conclusions drawn from multiple state/regional studies, the 'Data Needs' subcommittee recommends expansion of the state's groundwater level monitoring network as a means to address questions pertaining to availability and sustainability of groundwater, and greatly enhance the state's ability to effectively manage the resource.

Appendix A

Executive Summary of Stakeholder Input

Executive Summary
Stakeholder Input

The subcommittee solicited comments from involved stakeholders on two occasions, via a questionnaire distributed in December 2007 and a meeting held in May 2008, and continued to receive input throughout the plan development process. Although, opinions on the topic of statewide data needs relating to groundwater varied, the general caucus of opinion was that development and expansion of a groundwater level monitoring network was central to the issue of gauging sustainability of the resource. A broad range of input was submitted on the governing principle behind development of a network. The central tendency of the input received; however, suggests that the network design should follow the pattern of groundwater use across the state, and emphasize groundwater level monitoring in areas of higher intensity groundwater use.

Some of the network design concepts presented and/or discussed by stakeholders as either governing principles of the network, or requisite items that should be considered in network design included the following:

- Targeting network monitoring locations in specific geologic formations based on a ranking scheme related to the (aerial) prevalence of the formation in the state, and the number of well completion reports filed for each formation.
- Distributing monitoring stations so that they are representative of three primary physiographic provinces within the state [coastal lowlands, mountains, and inland/upland areas], with the emphasis in each province placed in high intensity use areas (as available).
- Establishing a non-continuous, and non-stationary network, whereby a large number of locations are identified and synoptic water level monitoring 'rounds' are conducted on a schedule at a subset of locations that vary for each monitoring round.
- Establishing a relatively small number of stations at 'key' locations to monitor the total hydrologic system. These stations would include meteorological [precipitation, evaporation, temperature, etc.], stream flow and soil moisture monitoring, in addition to clustered monitoring wells for groundwater level monitoring in overburden (as available) and bedrock. The intent of these stations would be to assess the potential for recharge by monitoring both potential inflows/outflows.

Practically all participants acknowledged that any wells included in the network should be properly catalogued and suitably gauged such that data collected from a point would accurately depict the water level conditions at its location and be able to be grouped with similar network monitoring station data for interpretative studies and/or trend analysis.

Groundwater Quality:

In general, the preponderance of input did not emphasize the need to include groundwater quality monitoring as a network priority, nor to focus the resources dedicated to network development on the collection and analysis of groundwater quality samples. The

importance of groundwater quality monitoring was recognized due to the fact that it speaks to the resource's suitability for use as drinking water; however, groundwater quality data, unto itself, does not address the core issue of resource availability and sustainability. Overall, groundwater quality sampling would be a secondary feature of the network, to be performed on a case- or project-specific basis, as funding opportunities are provided. Target areas for groundwater quality sampling discussed by stakeholders included:

- Compounds related to land use change and development (e.g. nitrate, chloride, volatile organic compounds, etc.);
- Salinity and chloride sampling in coastal communities to monitor saltwater intrusion along the seacoast;
- Naturally occurring groundwater contaminants prevalent in NH groundwater (e.g. arsenic, uranium, radon, etc.); and
- Stable isotopes.

Other issues:

Stream gauging: Expansion of the stream gage network was noted as intrinsically valuable in assessing groundwater availability due to the fact that baseflow of rivers and streams, assuming equilibrium conditions, is generally interpreted as an indicator/analogue to available groundwater recharge. Moreover, stream flow 'aggregates' various effects of hydrologic stresses across an entire drainage basin; for example, the developmental effects of an increase in impervious surfaces across a basin and its resultant reduction in groundwater recharge, can be observed through more immediate and higher peak stream flow during rainfall/runoff events, and lower stream baseflow at times of year when greater evaporation and more plant uptake is occurring. Therefore, streamflow is a more general, 'health of basin' indicator as it pertains to the bulk effects of basin-wide land use/water use practices.

Meteorological monitoring: Monitoring of meteorological conditions was also noted as a necessary component in determining the availability of groundwater within the state and region. The principle being that more rigorous tracking of precipitation, plant uptake and evaporation will lead to better determining the volume of water available for groundwater storage.

Appendix B

SB 162 Summary Table and Update

SB 162, December 2005, *Summary of Information Need for Effective Water Mgmt in NH*
Activity Status Review and Update - July 2010

	Project	Summary	Pertinent Activity / Status	Relative level of project attainment.
High Priority for All	Stream Gaging	Expand existing stream gage network and establish funding mechanism.	1) SGTF report of Sept 06 defines need, proposes network upgrades; **does not** isolate indelible funding source. 2) 2007 appropriation to recover/construct 15 priority gages through 2009; year-to-year general fund appropriation thereafter. 3) Further developement of priority gages still exist.	Moderate to Significiant
	Linking WQ info to location	Establish a unique ID for all wells and establish lab record of ID for water quality spatial studies.	1) HB 459 originally developed as well tagging legislation, changed to require GPS coordinates from drillers for all new wells. 2) NHDES lab pilot project in progress for voluntary release of private well water quality results - **status unclear**. 3) Bill for statewide well sampling requirement *failed* in 2010 NH legislative session.	Non-significant to Moderate
	Water Level - Well Network	Expand current water level network to include bedrock wells and automate data collection.	1) DES established program to record water levels in wells at Hubbard Brook. 2) One time appropriation to construct 9 new bedrock wells for network completed; network pending limited new instrumentation. 3) Draft expansion plan completed (2009)	Non-significant to Moderate
	GIS Data Layer Dvlpmt	Obtain Land Use Cover and Land Elevation data layers.	-	Non-Significant
High Priority	Water Quality - Well Network	Establish well network for ambient water quality sampling.	-	Non-Significant
	GIS-based waterbody assessment catalogue	Establish catalogue of waterbody indicators on a watershed basis for assessment studies and to track trends.	1) NHDES Watershed bureau published draft water montoring strategy report in Sept 05. 2) GIS layers established for 305(b) and 303(d) list water in 2006; revised to higher resolution (smaller) watershed basis in 2010. 3) VLAP/VRAP program data included in online EMD but not GIS format.	Moderate

SB 162, December 2005, *Summary of Information Need for Effective Water Mgmt in NH*
Activity Status Review and Update - July 2010

	Project	Summary	Pertinent Activity / Status	Relative level of project attainment.
High Priority	Surficial Geology Mapping	Complete statewide surficial geologic mapping effort.	Incremental mapping is ongoing.	Moderate
	Develop Estimates of Bedrock Recharge	Determine rate and method by which bedrock is recharged in stressed and non-stressed areas.	-	Non-Significant
	Merrimack River Eco Needs Assessment & Model	Evaluate low-flow characteristics of Merrimack and develop model to manage impoundments for low-flow augmentation/water use management.	Upper Merrimack Water Quality and Water Supply Study ongoing, funding has been procured through project completion and model development.	Signficant
	Weather Data Network	Design and implement real-time weather network.	No changes known to be implemented at existing network.	Non-Significant
Important	Salt water intrusion sentry network	Develop an understanding of and water level network to monitor the fresh/saltwater interface in seacoast region.	1) NHDES/NHCP awarded grant through NOAA to instrument wells in coastal communities. 2) Equipment has been acquired; well locations chosen; monitoring devices are deployed.	Complete
	Assess Private Well impacts on other users/resources	Assess water budget, determine water stressed areas and analyze effects of private well demand on water resources.	1) NHGS completed stressed-basin analysis in Piscataquoa River watershed; continuing work in other watersheds. 2) NHDES completes draft model ordinance for use by municipalities to assess impacts from private wells as part of local subdivision approval process.	Non-Significant to Moderate
	Refine Statewide Water Demand Estimate	Leverage water use reporting and metering requirements to refine water use estimates and trends - evaluate whether methodology used in Seacoast Study to refine water use estimate significantly different from current use-estimation approaches.	1) USGS Projected Water Use Study for Seacoast Region in NH released in April 2008. The need to refine water needs assessement based on report findings still under review. 2) NHDES implements inspection/ enforcement component to water use registration and reporting program.	Moderate

Appendix C

Geologic and Hydrogeologic Mapping and Infrastructure Needs

Aquifer Mapping

Geologic maps provide the baseline information for identifying and characterizing aquifers within the state. Geologic mapping is also important for the management and protection of groundwater. Maps can identify where water resources may be available for development, where recharge areas to aquifers exist, and for prediction of water quality problems (examples: radon, arsenic, uranium) that are associated with specific rock types. It is important to prioritize appropriate areas for protection to guard existing and future water supply sources. The National Cooperative Geologic Mapping Program (NCGMP) Act of 1992 created several programs to accelerate the geologic mapping of the U.S. at a detailed national standard scale (1:24,000) that can be used to make localized and assessments. The USGS Statemap program offers 50% matching funds for state geological surveys to complete geologic mapping. The state of New Hampshire has participated in this program for several decades. The New Hampshire Geological Survey (NHGS), a bureau of DES, directs the state's geological mapping program. Currently, New Hampshire has only mapped 45% of its surficial geology mapped at 1:24,000, and only 12 % of the state's bedrock is mapped at this scale. The current 1:250,000 state bedrock map is not an acceptable scale to conduct localized assessments, which is where there is the most demand. Accurate geologic maps provide important basic data needed for conducting ground water availability estimates, and derivative products based on these maps will be in demand for communities, local governments, developers, and consultants to use for developing local ground water ordinances, permitting requirements, and other issues identified by the SB 155 Ground Water Commission.

Statewide Mapping Projects

In 1997, the state reached a major milestone by completing a 1:250,000-scale bedrock geologic map of the state (Lyons and others, 1997). Figure 1 shows the generalized state bedrock map. The final map was constructed by compiling maps that were the product of scientific works of university professors and their students, the State Geologist, and USGS scientists. These maps were created at various scales and over a period of many decades; thus, it is acknowledged that inaccuracies in the final map exist. Therefore, the finished map represents a rectified tapestry of mainly pre-existing maps. The highly complex suite of igneous and metamorphic rocks in New Hampshire warrants complete mapping of the state at the more detailed, 1:24,000-scale. For example, natural ground water contaminants, such as arsenic, uranium, radon, have imparted a new emphasis on developing a detailed understanding of the underlying bedrock geology and mineralogy because geology is the primary predictor of where these elements are likely to occur.

The difference in the amount of detail regarding the shape and extent of specific rock formations between the generalized and detailed scale maps can be dramatic. For example, Figure 2 shows the same area (Pinardville Quadrangle) in southeastern New Hampshire mapped at the 1:24,000 (map on left) and 1:250,000 (map on right). The detailed map shows much more accurately the extent of specific formations (shown by different colors). Many of the smaller units are not even represented on the generalized state map. Moreover, the geology represented at the statewide scale lacks information about the nature, density, and occurrence of the fractures that occur in the bedrock, which is routinely made available on more detailed maps. The fracture patterns can vary greatly as a function of rock type, which affects their productivity as aquifers.. For example, a massive

granite formation often has a less robust and interconnected fracture pattern than a schist formation because of the different suite of minerals, as well as the way these rocks were originally formed.

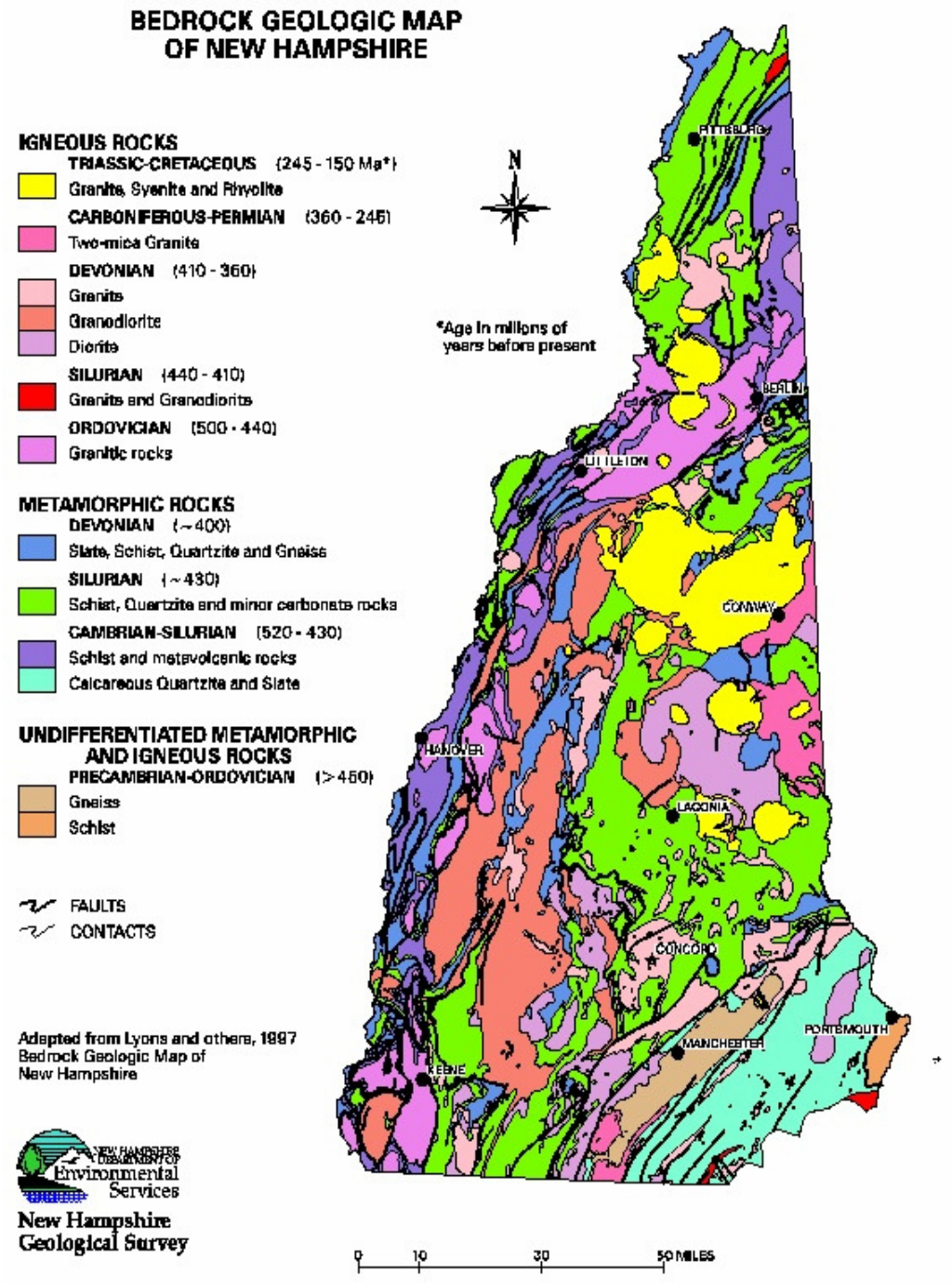


Figure 1. Generalized bedrock map of New Hampshire (from Lyons and others, 1997)

This fracture information is critical for developing ground water resources because the occurrence and interconnection of fractures is what allows the dense, crystalline rocks underlying New Hampshire to transmit and store ground water. Figure 3 is an index map that shows the current status of completed and in-progress mapping of the bedrock at the 1:24,000 quadrangle scale. Only 26 of the 213 tiles are complete, which is approximately 12 percent of the state.

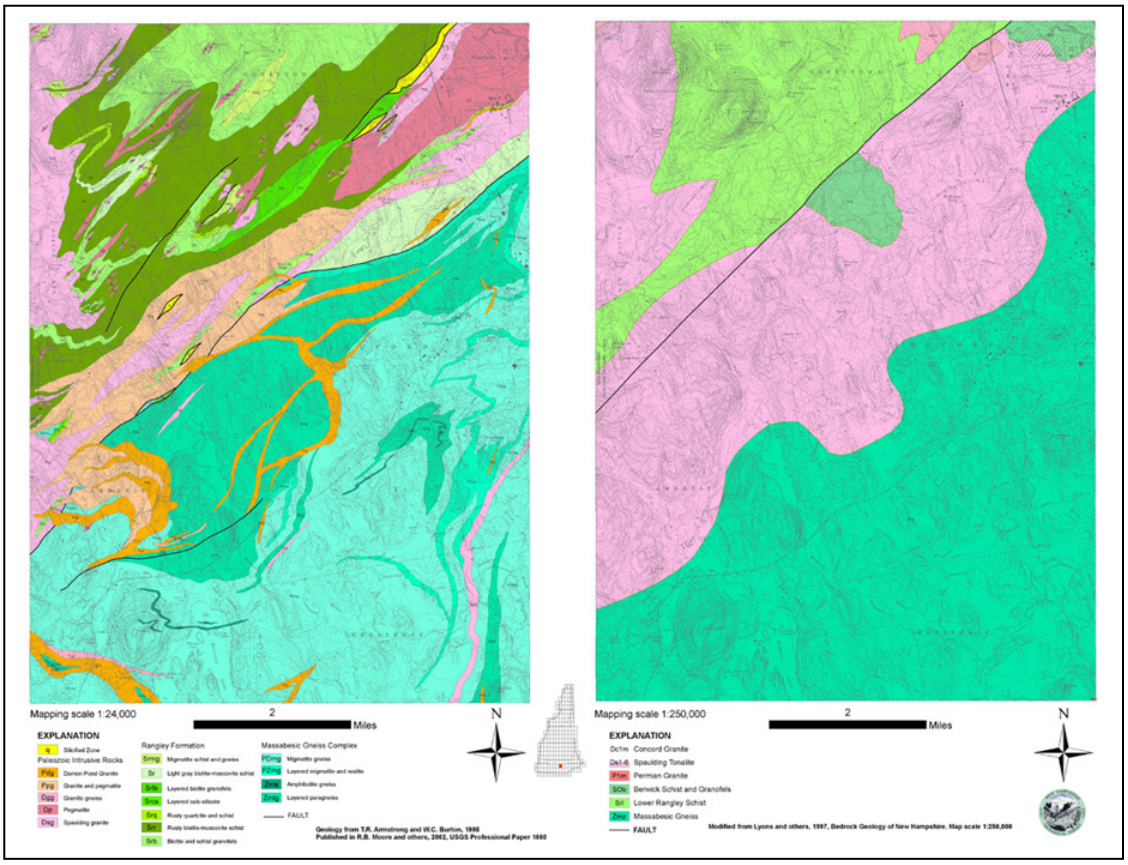


Figure 2. Pinardville Quad mapped at detailed 1:24,000 scale (left) and statewide 1:250,000 (right). Significantly more detail about the type and extent of rocks can be seen in the detailed map.

Surficial Geology

The State of New Hampshire and the USGS entered into cooperative project in the 1990's to map the stratified drift aquifers in the state. This was a multi-year project that produced excellent products that are still widely used today. Stratified drift is a generic term that refers to mainly the sand and gravel deposits that were deposited by glacial melt

water during the previous ice age. These materials are also part of the overall surficial geology. The drift deposits, where saturated, tend to store and transmit significant amounts for ground water. However, these deposits are usually quite localized, and tend to be located within major drainage valleys, and only cover about 14% of the state. Much of the development in New Hampshire is also concentrated in the river valleys, so many of the drift aquifers underlie well developed urban centers. The stratified drift maps were published according to planning regions, and are represented at 1:24,000 scale. The maps outline the areas of towns that are underlain by drift. Although the scientists who developed these maps made it clear that the boundaries are inferred, many towns, planning commissions, and others tend to make a strict interpretations of the aquifer boundaries shown on the maps, which is an inappropriate use of the information.

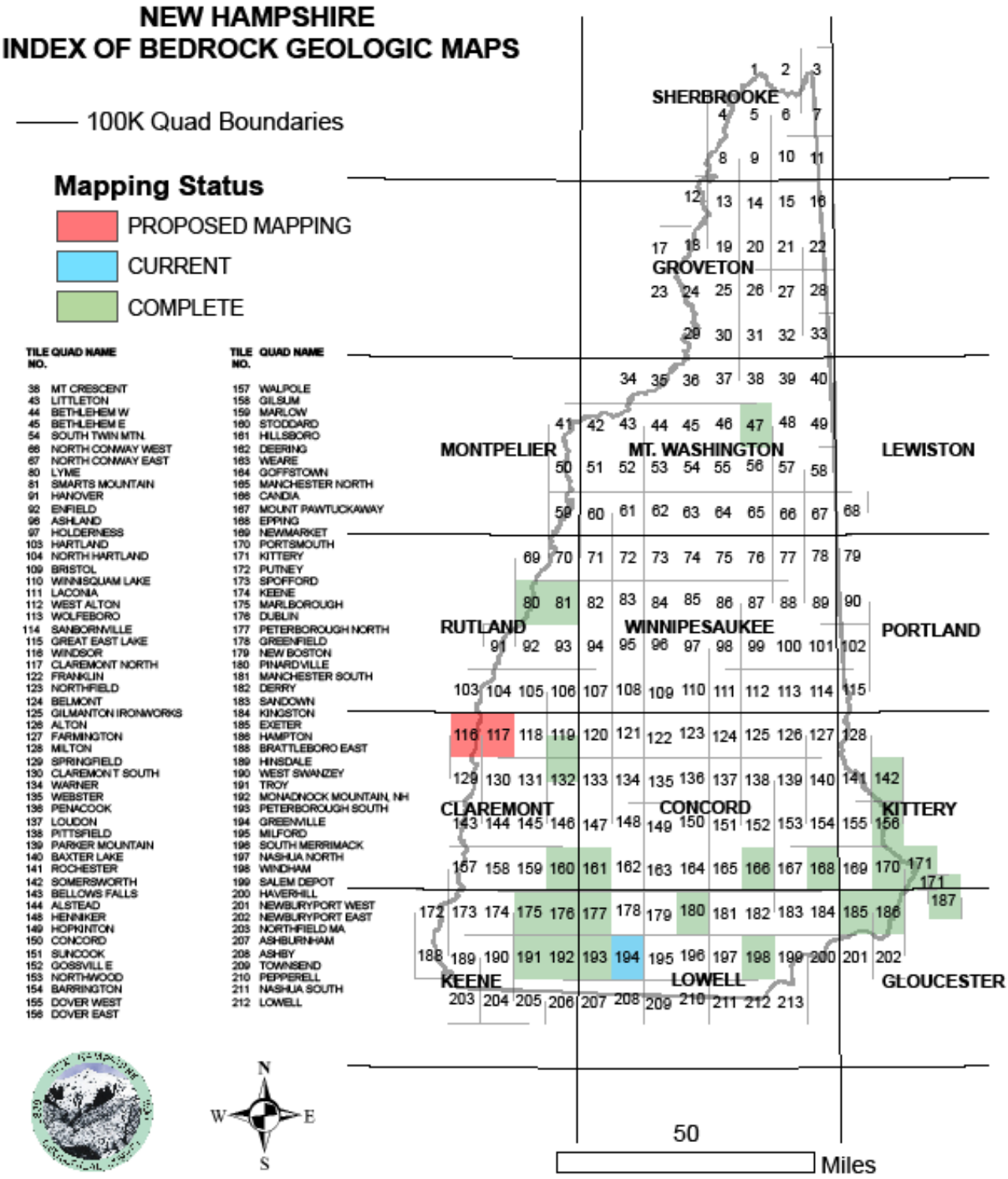


Figure 3. Index of completed or in-progress bedrock geological maps for New Hampshire

Figure 4. Index of 1:24,000 surficial geologic mapping in New Hampshire

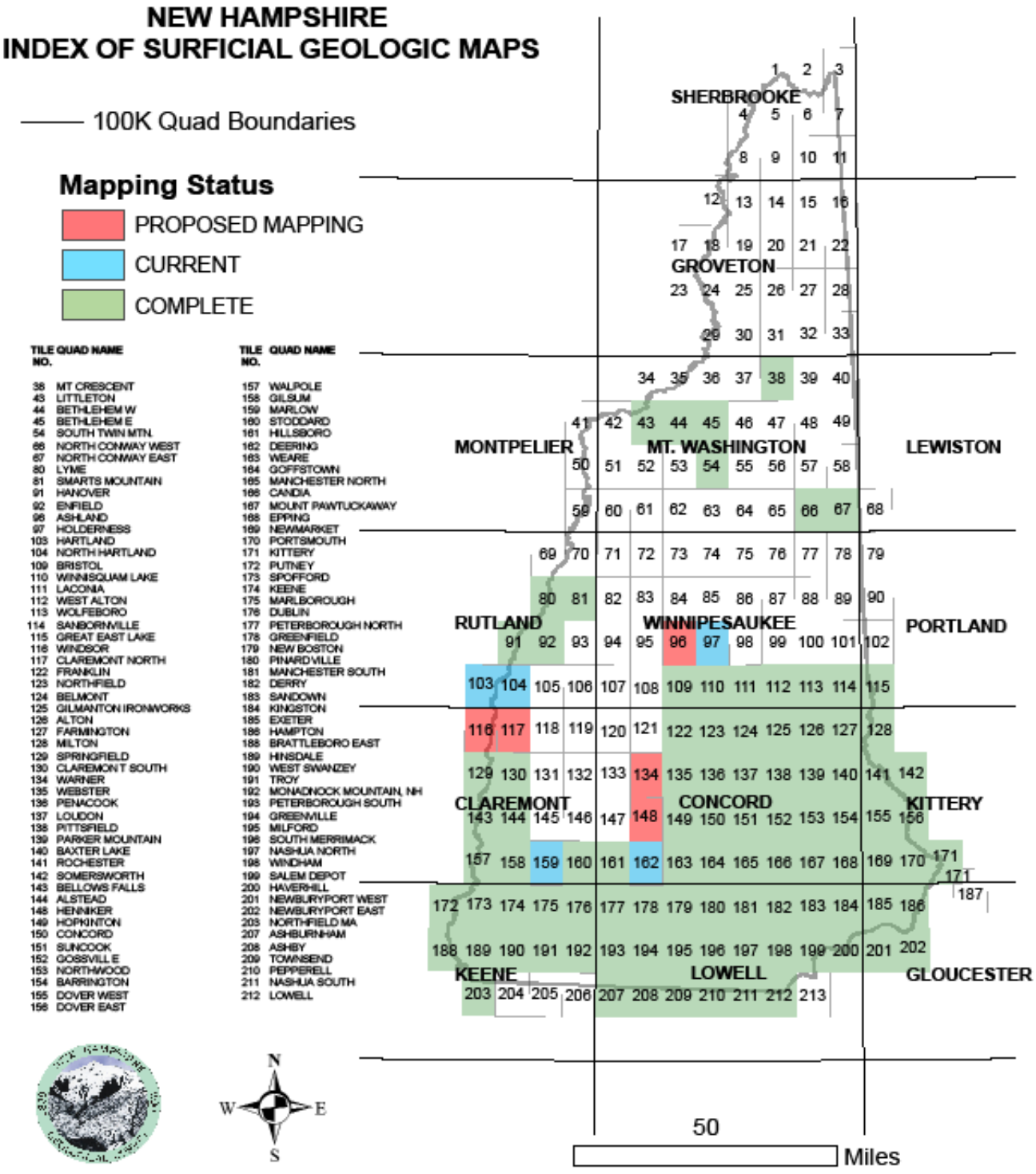


Figure 4. Index of completed or in-progress surficial geological maps for New Hampshire

One of the principal ways the surficial geology maps differ from the stratified drift maps is that surficial maps show all of the various types of geologic deposits that exist in an area, not just the stratified drift. Knowledge of the other geologic materials surrounding or overlying an aquifer is also important for ground water assessments and protection. For example, clay and silt deposits can serve as aquitards, which are relatively impermeable geologic units that can protect underlying drift aquifers, or create hydrogeologic conditions conducive for artesian wells, which are often prolific water producers. Moreover, the surficial geologic maps assist with identifying areas around aquifers most suitable for land uses such as landfills and industrial sites, so that shallow aquifers can be protected. Currently, New Hampshire has only mapped 45% of its surficial geology at the 1:24,000. Figure 4 is an index that shows the current status of mapped quadrangles, and those in progress for the state.

Modern geologic mapping of the state's surficial geology has an advantage of having many thousands of more wells than were available when the stratified drift maps were being compiled nearly two decades ago. Water wells provide important information about the geology in the subsurface, which helps to determine the thickness and extent of the aquifer boundaries. As discussed previously, this has important implications because local officials often use the boundaries on the stratified drift maps as hard and steadfast, and at times they can be in conflict with more recently published surficial maps. For example, Figure 5 shows an area with the stratified drift aquifer boundaries along with the boundaries of the materials consistent with stratified drift from a surficial geologic map published for the same area. There is modest disagreement between the two. However, advances in remote sensing capabilities, coupled with the significant increase in the number of well records and other subsurface information statewide, will allow for better rectification of the drift aquifer boundaries in the future. More accurate map boundaries will have huge implications with regard to accurate authorization for specific land uses, water rights, and aquifer protection.

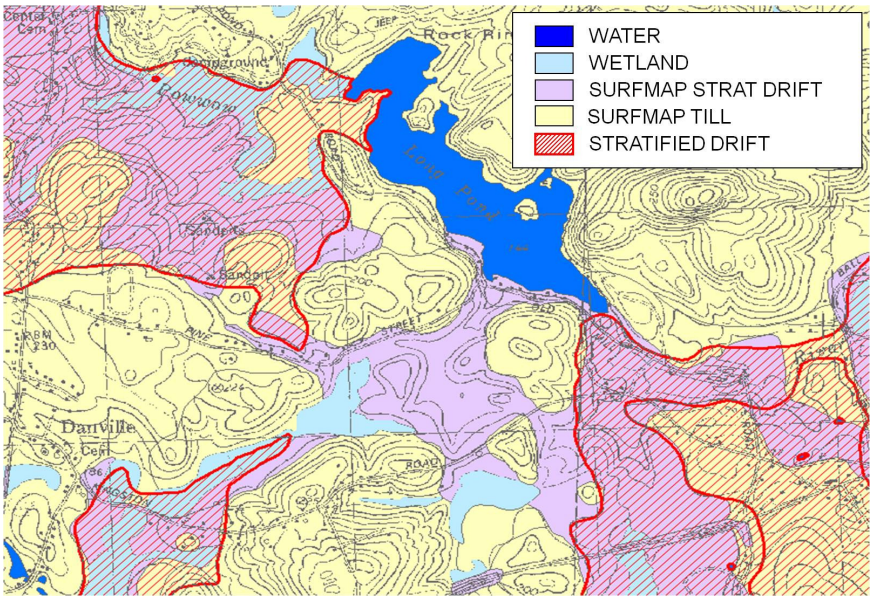


Figure 5. Difference in extent of stratified drift materials shown on a surficial map (purple regions) and stratified drift from USGS map (red stippled region).

Advances in computer modeling has allowed for derivative data sets to be produced from existing data (e.g. well data, surficial geology) that can provided important information for water management needs. For example, recharge maps have been created for most of the Piscataqua Watershed in southeastern New Hampshire at a very fine resolution that can estimate the amount of precipitation that will enter the ground and recharge the underlying aquifers. Figure 6 shows an example of estimated recharge for near Durham, New Hampshire. Estimates for water availability and future sustainability of ground-water supplies hinge on accurate estimates of recharge, as this is throught to be the amount of "renewable" ground water that is available in a given year. Other important data needed for recharge modeling include:

- Land use or land cover data
- Soils maps (NRCS agricultural soils)
- Impervious surface data
- Accurate elevation model for hydrologic modeling

Accurate elevation data for creating elevations models are critical for accurately determining the flow direction of surface runoff and flow, and for calculating drainage divides for water sheds and catchment basins. The standard elevations data set that has been available from the federal government has been the 30 meter (pixel) digital elevation model (DEM). NHGS has acquired more accurate 10 meter data, and also created new data for some areas of the state such that New Hampshire now has nearly complete coverage at the ten-meter level. However, portions of the northern section of the state, as well as along the Massachusetts border, are still lacking. The state-of-the-art, and most accurate elevation models are based on data collected using light detection and

ranging (lidar) technology, which can determine vertical differences in the sub-meter range, resulting in a very accurate depiction of the land's surface.

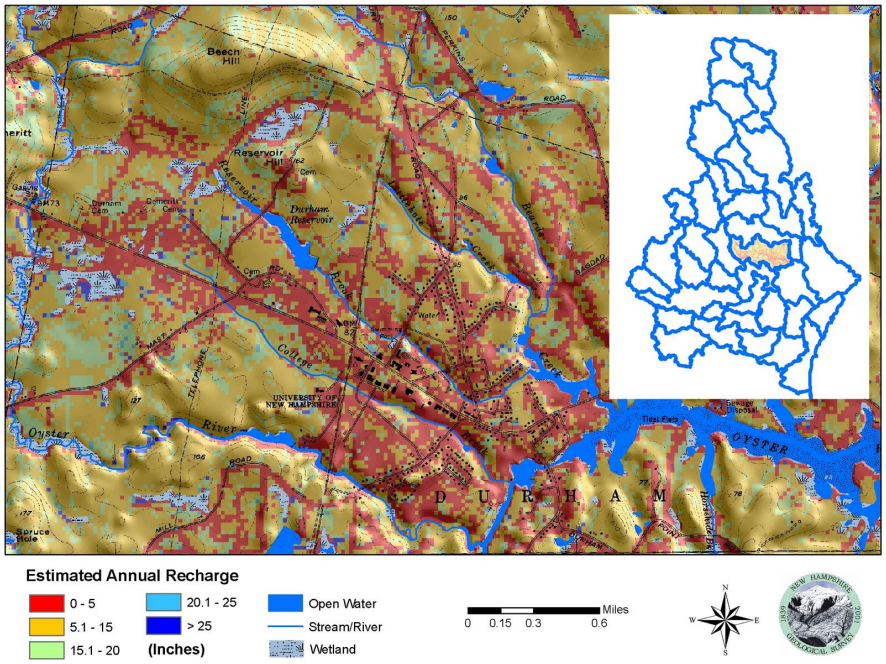


Figure 6. Estimated recharge for Durham, NH area (NHGS)

This is a critical component for accurate hydrologic modeling for both surface and ground water. Figure 7 shows the difference in accuracy and detail from 30 meter, 10 meter, and 1 meter (lidar) elevation models. Figure 8 is an index map of the quads which we currently have 10 meter elevation model data.

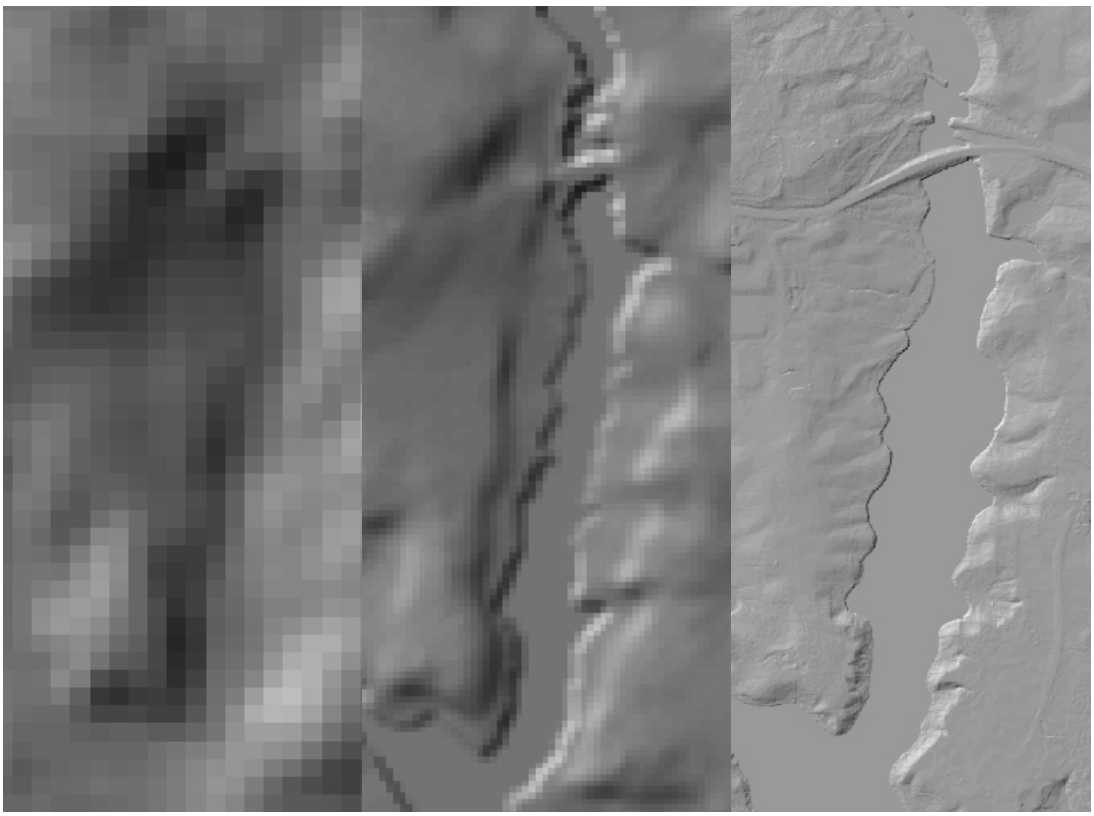


Figure 7. Elevation model at 30 meter resolution (pixilated scene at far left), 10 meter model (middle scene), and lidar elevation model with sub-meter accuracy (right scene) (source: NHGS)

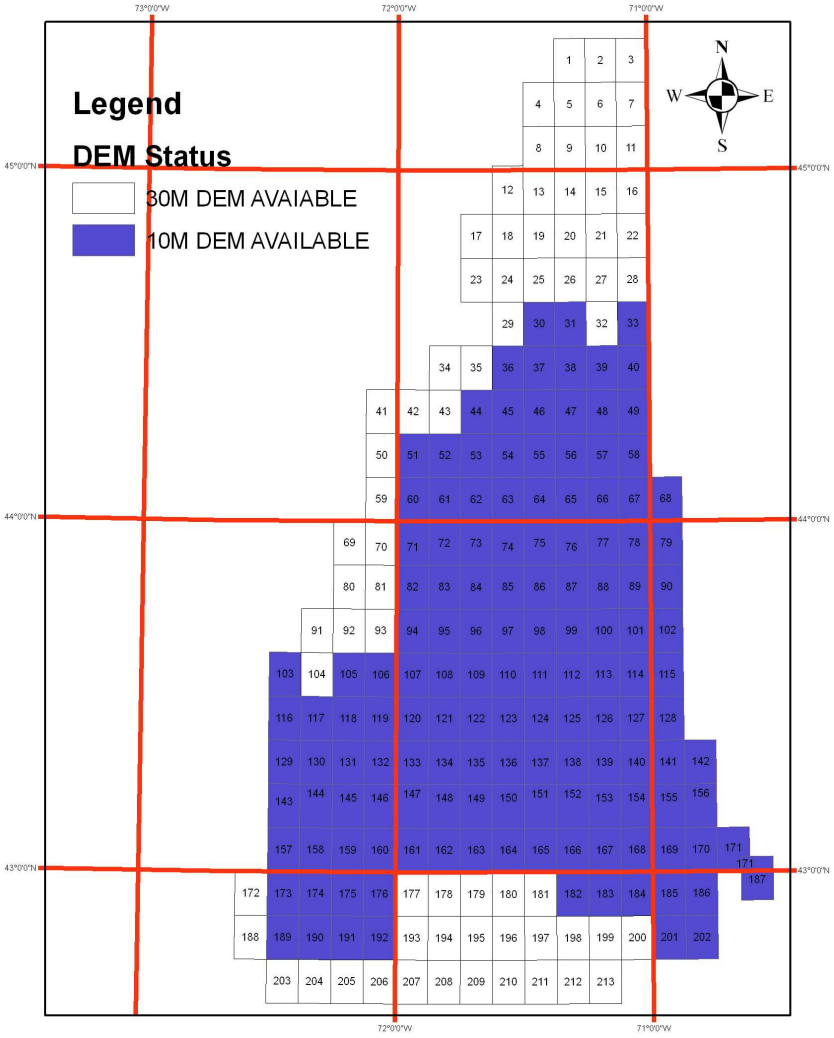


Figure 8. Index of 10 meter elevation model data for New Hampshire

References:

Lyons, John B; Bothner, Wallace A.; Moench, Robert H.; and Thompson, James B., 1997, Bedrock Geologic Map of New Hampshire, U.S. Geological Survey, Reston, VA, State Geologic Map, 2 sheets, scale 1:250,000.

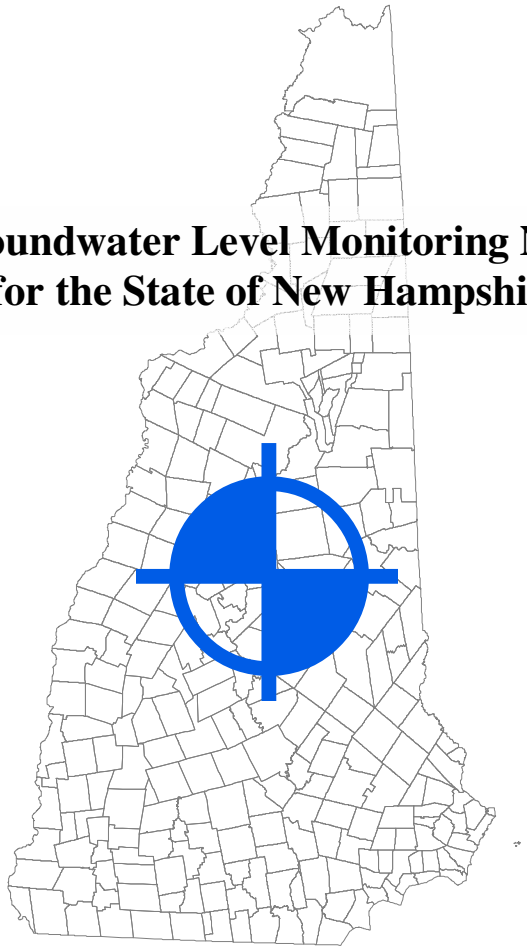
Moore, R.B., Schwarz, G.E., Clark, Jr., S.F., Walsh, G.J., and Degnan, J.R., 2002, Factors related to well yield in the fractured-bedrock aquifer of New Hampshire: U.S. Geological Survey Professional Paper 1660, 51p. plus 2 plates.

Appendix D

Groundwater Monitoring Network Plan

SB 155 – Commission to Study Issues Relative to Groundwater Withdrawals
Issue No. 6: Groundwater Management Data Needs - Report

A Groundwater Level Monitoring Network for the State of New Hampshire.



July 19, 2010

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Tables

Figures

Introduction

This report presents a plan to develop a groundwater well monitoring network for the State of New Hampshire. Although the state does have an existing groundwater monitoring network, the 'conceptual framework' used to develop it was related to a project that mapped the extent of stratified drift deposits across the state; as a result, the number of monitoring wells in the existing network is relatively small, mostly overburden wells, and their locations, being more narrowly focused in areas of drift deposits only, does not reflect the inferred pattern of groundwater use intensity across the state. Therefore, the plan developed herein emphasizes monitoring within high intensity groundwater use areas and close to meteorological or stream gage stations, thereby enabling the network to resolve the 'resource sustainability' question by framing groundwater available in storage within the context of nearby inputs and exports.

This report and plan was developed in accordance with the statutory mandate of the SB155 Commission to Study Issues Related to Groundwater Withdrawals [a.k.a. the Groundwater Commission] to address issues of groundwater availability and sustainability in the state and identify the information needed to effectively manage groundwater resources to the benefit of state residents in the future.

Groundwater Level Monitoring Network Plan

Network Goals

The overriding objective of the groundwater monitoring network is to provide a repository of high quality data to assist in effective groundwater resource management within the State. Due to the inherent diversity of New Hampshire's groundwater resource as well as its wide spectrum of groundwater users, in order to meet this objective, the goals of the monitoring network need to be broad in scope, while retaining the ability to answer specifically targeted questions. In descending order of priority, the goals include:

1. Observe and record groundwater level trends in high-intensity groundwater use areas to track and assess availability of the resource and trends in these areas over time.

2. Identify a subset of groundwater level monitoring sites within the network that are sensitive to changes in shorter term climatic conditions and include them within a 'drought indicator' monitoring network. Once identified, develop a framework of groundwater level criteria for the drought indicator monitoring well network and incorporate that framework into New Hampshire's *Drought Management Plan*.

3. Observe and estimate the 'flux' of water (from recharge to discharge) through the groundwater system by co-locating a subset of groundwater monitoring sites near stream gage and meteorological stations with particular emphasis on referential watershed locations or watersheds identified as stressed with respect to water use.

4. Assess the potential influence of the effects of climate change on groundwater levels in the state through collection of long-term groundwater level records.

As reflected in the goals above, the purpose of the network is to give regulators, policy makers and scientists a sufficient quality and quantity of information and data at locations that are most pertinent to the issue of groundwater demand, use and long-term availability. All information and data collected from the network shall therefore be collected, stored and managed in a manner that ensures it is readily available to state and local decision makers, as well as the general public, for use in making informed decisions pertaining to groundwater.

Network Design

As the goal of the plan is to the assess and track the availability of the resource in the context of its potential for stress, the design of the groundwater level monitoring network shall need to be spatially consistent with the pattern of groundwater use across the state. Owing to the fact that there is no single metric for where groundwater use is high or increasing, the basis for the general target areas for network monitoring stations necessarily uses resources and information that are readily available and *infer* groundwater use potential. Figures Nos. 1 and 2 depict the fundamental data that the subcommittee feels most adequately frames the potential for groundwater demand. These figures present data on areas of high population density (based on US Census data); geo-located well completion records that indicate proportionally large numbers of private water wells; locations, numbers and density of registered and reporting water users that are indexed as groundwater withdrawals; and the distribution of public water systems serving greater than 500 people [indexed by source type]. The presentation of population and water well data is provided on a town specific basis (as that is how it is recorded) and is categorized by percentile of occurrence in order to provide a relative index of the groundwater use potential in each town compared to the general statewide potential groundwater demand 'signature'.

In review of the information depicted on Figure Nos. 1 and 2, a semi-quantitative pattern presents itself as three general 'sectors' of groundwater demand potential; designated as sectors A, B and C on the figures. Sector A includes the east and south central coastal areas, lakes region and Conway area, and represents the highest potential for groundwater use. Sector B is inferred to present a moderate degree of potential groundwater use and includes the west and south central inland/valley areas. Sector C presents relatively low potential for groundwater use/stress and includes much of the northern tier of the state inclusive of the White Mountain district. Table 1. below presents summary statistics for these three sectors.

Sector	Percent Population	Percent Well Records	Percent Reg. Groundwater Withdrawals	[2]Existing Gravel Wells	[3]Existing Bedrock Wells	Proposed Wells	Total	Percent Total
A	76%	67%	67%	10	7 (4 sites)	60	77	63%
B	19%	25%	20%	8	2 (1 site)	25	34	28%
C	5%	8%	13%	7	2 (1 site)	5	12	10%

Table 1. Sector Information Summary (ref. Figures 1 through 3)

In keeping with the objective of this plan, the groundwater level monitoring network design, as a whole, is proposed to emphasize monitoring of groundwater levels in Sector A accordingly, but also provide for some degree of monitoring in areas that are less representative of high intensity groundwater use (Sectors B and C). Among other purposes, monitoring of groundwater levels in background or ambient areas that are less representative of intense groundwater use enables the network to track potential long term effects of climate change on groundwater (another network goal) by limiting the possible forcing functions of groundwater level change to those that are not a direct result of human activity on the land surface, and will serve as an adequate benchmark for long-term trend assessments in other areas.

Network Size, Distribution and Well Type

In general, there is no consensus of opinion on the *exact* number of monitoring stations needed in the groundwater monitoring network to ensure that it "adequately" reflects water level fluctuations or variability across the monitored areas. Essentially, due to the 'statewide' scale of this monitoring effort, the wide range in hydrologic settings that are present across the state and the number of unknown environmental variables, a fixed approach to establishing the network size based on environmental characteristics alone is not suitable. In relation to the method described above to infer the statewide pattern of groundwater use, the number of monitoring wells and their distribution is thereby proposed to be commensurate with each sector's inferred degree of potential groundwater demand [ref. columns 7 through 9, Table 1]. Figure 3 depicts the number of current and proposed monitoring wells in each sector.

Apparent through review of this plan is that the 'bulk' distribution of the proposed monitoring wells contrasts the idea that the network design be based *solely* on the physiographic limits of watersheds or catchment basins; or mapped extents of geologic units or aquifers. This approach pays homage to the fact that the majority of groundwater withdrawals in the state are from private, open-borehole, bedrock wells that capture

[2] These wells include 21 shallow sand and gravel monitoring wells currently monitored by NHGS, 1 well currently monitored by USGS, and 3 wells currently monitored by volunteers with readings directly reported to USGS. These wells were installed as part of a prior study conducted in the late 1980s – 1990s to map stratified drift deposits across the state.

[3] These wells include 10 wells monitored by NHGS (9 new wells installed in 2009) and 1 well monitored by USGS.

groundwater via a network of interconnected and discrete fractures with widely varying physical characteristics, and with recharge area limits that are not readily identifiable[4].

No specific point locations are provided for monitoring wells in each of the sectors as they will likely be dictated by arrangements that are made with various public or private entities that own inactive wells at desirable locations where permission to monitor is garnered by the monitoring agency [see discussion below], or other means. However, when obtaining well locations within each sector, the specific locations targeted for monitoring wells should attempt to be reasonably representative of a range of parameters, including: hydrogeologic unit boundaries; topography; land use/development patterns; hydro-climatic zone; and population density. In addition, the locations chosen within each sector should be indicative of both non-stressed (or ambient) and stressed areas to adequately establish a comparative baseline for evaluating resource sustainability within each sector relative to factors that effects availability.[5] Bedrock monitoring wells should also be preferentially incorporated into the network as fractured bedrock represents the predominant water-bearing source for most groundwater users in the state.

Comprehensive Hydrologic System Monitoring Stations [CHSMs]

Included in the network plan are target locations for five Comprehensive Hydrologic System Monitoring stations [CHSM]. The CHSM locations would be outfitted to measure numerous hydrologic parameters at their locations to more fully capture the movement and availability of water through the complete hydrologic system. The types of devices proposed at each CHSM would include:

- 2 to 4 monitoring wells (a shallow and deep bedrock well and a shallow and deep overburden well);
- A soil moisture/temperature probe;
- A transect for profiling snow-water equivalence [SWE] and other plot data;
- A small-scale meteorological station (as necessary); and
- A small-scale stream gauging station (as necessary).

As shown on Figure 3, the CHSM locations proposed for each sector/region were chosen to maximize available assets and leverage existing stream gages and meteorological stations. Table 2 provides a breakdown of the attributes of each location and their existing fixed assets.

[4] Kenny, J.F., Barber, N.L., Hutson, S.S., Linsey, K.S., Lovelace, J.K., and Maupin, M.A., 2009. Estimated use of water in the United States in 2005: U.S. Geological Survey Circular 1344, 52 p.

[5] The New Hampshire Geological Survey has recently completed the Stress Basin Analysis project for the Piscataqua River Basin that assesses water demand versus availability on a small catchment basis. The current project serves as a model for statewide implementation and efforts to complete a statewide stressed basin analysis are ongoing. Results from such a model would be used to assist in 'targeting' monitoring well locations within individual sectors to more fully address the question of relative groundwater availability in stressed versus non-stressed areas.

General Location	River (Stream Gage No.)	Weather Station (WBAN No.)	Sector / Major Watersheds	Geographic Region
Claremont / Newport	Sugar River (01152500)	Springfield Airport [VT] (54740)	Sector B Contoocook, Lower Connecticut, Lower Pemigewassett	Inner Valley / Uplands
Jaffrey / Peterborough	Contoocook River (01082000)	Jaffrey Muni Airport (54770)		Central Valley / Uplands
Manchester / Goffstown	Merrimack River (01092000)	Manchester Airport (14710)	Sector A Merrimack, Salmon Falls, Lamprey	Central Valley / Coastal
Lee / Durham	Lamprey River (01073500)	UNH Durham (54794-95)		Coastal Lowlands
Thornton / Ellsworth	Hubbard Brook Experimental Forest : Various hydrologic, soil, vegetation, and meteorological monitoring stations and points.		Sector C Upper Pemigewassett Upper Connecticut Ammonoosuc, Androscoggin, Saco	Uplands / Mountains / North-Central Valley

Table 2. Attribute information summary for CHSM locations (ref. Figure 3).

Overall, the data collected from CHSM stations would establish a baseline index for the sector/region that would be useful in correlating the volume of water available in storage with regionally relevant potential recharge (via precipitation and evapotranspiration estimates), and discharge through local stream gage records (i.e. baseflow). Such data would serve to aggregate the recharge-discharge 'signal' for a given region and would further highlight and resolve anomalous groundwater level changes at other point locations within the sector. As such, the CHSM data would enhance the state's ability to assess impacts from droughts or dry periods on the resource, and adequately assess the degree of recovery from the same by more fully characterizing drought effects on all components of the hydrologic system. A recent effort completed by NHGS to install bedrock wells at four locations have incorporated the concept of multilevel monitoring indicative of the method for CHSM stations described here.

Network Station Construction and Instrumentation

Adequately qualifying the data collected from the monitoring network necessitates recording some degree of well-specific information from each of the network's groundwater monitoring stations. This well-specific information will serve to 'assign' the data collected from each monitoring point to the appropriate hydrogeologic unit, and validate both the conclusions drawn from network measurements as well as groundwater management decisions borne from those conclusions. Further, the data collection methods employed within the network shall need to be consistent and of high quality in order to meet the general objective of developing a repository of observations that are readily suitable to comparative trend assessments and studies.

The monitoring stations shall emphasize the acquisition and recording of groundwater levels from bedrock wells, however, when suitable relative to the geologic setting, monitoring stations should be a cluster that includes a minimum of two monitoring wells, one installed in unconsolidated overburden deposits and one installed in fractured bedrock. This well cluster approach would allow for evaluation of vertical gradients at the given monitoring station and speak to whether the location is in a likely groundwater recharge or discharge area.

For new wells that are installed as part the monitoring network development process, borehole logging should be conducted during well drilling activities by a qualified individual to observe and record the presence of water bearing zone(s), porous media characteristics, rock type, lithologic unit changes, etc. For existing wells that are incorporated into the network through mutual agreement with the well owner, after-the-fact borehole geophysical logging should be conducted to gather additional station-specific information about the geologic unit that is 'observed' by the well, and to assess the mechanical integrity of the well(s) construction [see discussion below].

Once established, the location and reference point elevation of each well shall be surveyed and incorporated into a maintenance program that reassesses each well's integrity and checks the reference elevation at specified intervals.

Groundwater level measurement frequency at network monitoring stations should be of a sufficient resolution to observe the effects of anticipated hydrologic stresses in the region or area being observed. In high intensity groundwater use areas, both short- and long-term stresses that could impact groundwater levels exist (e.g. increased development and land use change; municipal infrastructure expansion; changes in patterns of discretionary water use; and changes induced by governing environmental conditions). In areas not subjected to high intensity groundwater use and/or high rates of development, ambient environmental conditions are likely the predominant hydrologic influence on groundwater levels.

The timeframe for the effects of hydrologic stresses in high intensity groundwater use areas are not easily predictable and are likely to vary as greatly as the types of stresses themselves. It is reasonable to assume that groundwater level changes may occur in high intensity use areas on a sub-seasonal basis, consistent with the pace of modern construction practices, given that these areas are dominated by developed land. Therefore, the target groundwater level monitoring frequency for the majority of monitoring stations located in these areas should be daily to weekly. Monitoring of groundwater levels at a lesser resolution may not provide for a sufficient data record to resolve shorter duration effects of land use changes, related increases in withdrawals due to those changes, impacts due to sub-seasonally driven discretionary water use, or drought. In addition, a higher frequency of measurements may be valid for those stations near the seacoast in order to track the possible inland migration of diurnal tidal effects on groundwater levels over time. Further, some degree of control point monitoring at a higher frequency in low intensity groundwater use areas should be used to act as an adequate benchmark for comparative assessments to high groundwater demand areas,

otherwise, groundwater level monitoring in these areas could be monthly to quarterly. As described below, at least 50% of the network should be targeted for automated water level recording, at as high a frequency as can be reasonably achieved with the technology used.

Network Operation

Operation and management of the network could be a shared duty of NHDES and USGS. The shared aspect of network management benefits both entities by maximizing the limited pool of resources made available to each agency for such programs. Such an arrangement could be optimized by collating the station acquisition, data collection and management capacity of NHDES with the instrumentation, data handling, processing and delivery capacity of USGS. As situations permit, willing municipalities or volunteers could be designated by either agency to expand on the personnel resources available to the agencies to, possibly, increase monitoring resolution and frequency.

Network Implementation Strategy and Cost Estimate

Like any similar monitoring program, the degree to which the goals of the network are achieved will be functionality dependent on the level of resources that are dedicated to its development, maintenance and operation. Given that the goals of the network are intended to be as comprehensive as possible, yet the resources available to develop the network will be finite, construction of the network itself must therefore follow a prioritized implementation plan that most efficiently uses those resources. Of particular relevance to implementing this network is that there are likely to be existing wells currently located within target areas that may be well-suited to be included in it. Some potential resources include:

- **Wells in the current network**: The existing groundwater monitoring network is described in Attachment A. The network is largely made up of relic wells from a geologic unit mapping project, and, in general, is not well positioned to fully meet all of the network goals proposed herein. Due to the age of these wells, consideration should be given to dedicating initial resources that are made available to the network to refurbishing, restoring and/or replacing valuable existing wells, as necessary. Recent efforts have expanded monitoring to include some bedrock wells at the Hubbard Brook Experimental Forest, at points that are likely to remain serviceable in the long term.

- **Wells on state-owned or other publicly held land**: Various state agencies hold ownership for property located across the state and, although current uses vary, the prior use of some state owned property has included the installation of well or wells to serve the water supply needs of a former owner. NHGS has initiated efforts (largely through NH Dept. of Resources and Economic Development [DRED]) to identify wells that the state currently owns but may not use, and determine their suitability for use in an expanded groundwater level monitoring network. Efforts in this area are ongoing.

- **Non-Used (Inactive) former Public Water Supply wells**: The type and size of public water systems vary widely across the state. On occasion, a water system ceases using its source well or wells for reasons potentially related to water quality or quantity, or interconnection with a nearby (and usually larger) water system through a water service agreement, leaving their old source(s) unused. DES' Drinking Water and Groundwater Bureau (DWGB) tracks the 'active' or 'inactive' status of public water systems in the state and their sources. In review of DWGB records, over 400 inactive wells are recorded at being in over 100 towns within the state. Note that many of the wells may no longer exist or be available for consideration for inclusion into a network. Many systems may also have old exploratory, non-operable or non-usable wells that were never put into service that are accessible.

- **Well installed through activities and investigations at potential and known hazardous waste sites**: DES' hazardous waste bureau oversees numerous statewide projects at potential and known contaminated sites. Through the requisite site investigation activities, monitoring wells (predominantly overburden and less frequently bedrock) are installed across a given site to evaluate site conditions and contamination. In some instances, DES funding is used to both install wells and perform related sampling and surveying.

In reference to the fact that some resources for the network may already be available through coordination with existing wells owners, the more efficient path to network implementation would be a two phase process: whereby Phase 1 is acquiring and instrumenting existing wells in target areas through an outreach effort to existing well owners; and Phase 2 would constitute installing new monitoring wells at locations that are yet to be determined. Given the number of non-used/inactive wells that are likely in existence, as well as the substantial cost savings per unit well, the focus of effort should be given to acquiring wells under Phase 1, and the degree of effort put into Phase 2 will address any network development deficits.

Table 3 provides a general cost estimate for implementing the two phase approach to network development. Successful completion of Phase 1 will depend largely on NHDES' ability to leverage relationships with owners of existing groundwater wells that are no longer used, and establishing long-term arrangements with those entities for indelible access. Phase 2 is necessarily more costly due to the initial construction costs related to monitoring well drilling, characterization and installation. Note that the estimates in Table 3 are based on the assumption that NHDES is successful at acquiring 67% (60 wells) of the proposed 90 new wells [see Table 1] in the proposed network as part of Phase 1. Note also that Table 3 incorporates an estimate for one additional staff member to operate, oversee and implement network duties and tasks once near completion.

Table 3.
Groundwater Level Monitoring Network Implementation / Operation Cost Estimate

Phase I Budget - Existing Wells

	Number of Wells	Task	Unit Cost	Total Cost	Cost Assumptions / Basis / Comments
Fixed Costs	60	Acquisition	$ 500	$ 30,000	Legal review, access agreements, use rights, filing fees. Well equipment removal costs (as necessary).
		Instrumentation	$ 1,200	$ 72,000	Assumes automating ~50% of the total of ~120 network wells (see Table 1). Monitoring Device: Non-disposable, vented pressure transducer (onboard datalogging). Misc: Well cap equipment and security enclosure with lock.
		Total - Fixed Cost: Phase 1		$ 102,000	

Phase I Note: Budget assumes NHDES acquires 60 of the 90 proposed new network wells (67%) from cooperating third parties (see Table 1).

Phase II Budget - New Wells

	Item	Task	Unit Cost	Total Cost	Cost Assumptions / Basis / Comments
Fixed Costs	20 - Bedrock Wells	Construction	$ 10,000	$ 200,000	Basis: NHGS 2009 bedrock well drilling program costs. Legal review, access agreements, use rights, filing fees.
	10 - Overburden Wells		$ 2,000	$ 20,000	
	4 - CHSM	Well Construction	$ 24,000	$ 96,000	Basis: NHGS 2009 bedrock well drilling program costs. 4 wells at each CHSM (1 each shallow/deep bedrock and shallow/deep overburden).
		Instrumentation	$ 4,000	$ 16,000	Devices: Per station - 1 self powered multi-channel datalogger, 4 non-vented pressure tranducers, 1 barometric sensor, 1 soil moisture sensor. Misc: Well cap equipment and security enclosure with lock.
		Total - Fixed Cost: Phase 2		$ 332,000	

Phase II Note: Instrumentation for the new wells not related to the CHSM stations is included in Phase I Instrumentation line item.

Annual Cost Estimate

Annual Costs (non-staff)		*Total Annual O&M, and Data Mgmt*	$ 25,000	Basis: - 25% of total instrumention fixed cost for 120 points, to include: Software/Firmware upgrades, data handling management software; Consumable equipment, maintainance, power supplies, replacement devices. - $1,500 annual appropriation for water quality sampling (5-year sampling schedule). - $1,500 annual travel appropriation for data collection.
Annual Staff Costs		*One additional staff position to operate network*	$45,000 to $65,000	Range estimate will vary based on labor grade, step and benefit package.

General Note: All instrumentation cost estimates based on quoted equipment prices from Global Water Instrumenation, Inc.

Figures

Figure 1. Statewide Population Density
Total Population = 1.24 M [Census 2000]

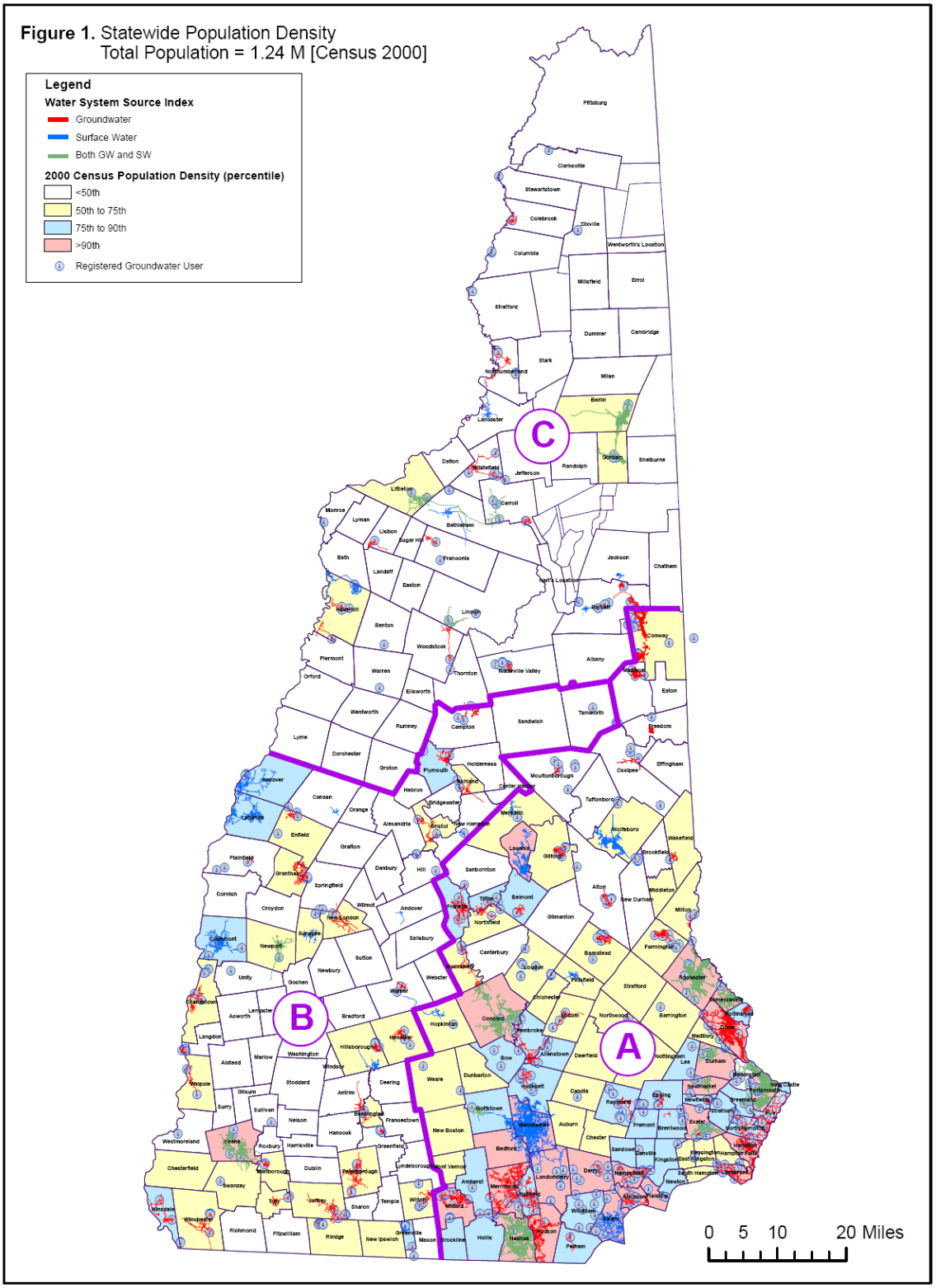


Figure 2. Distribution of Statewide Well Construction Records
Total Count = 106,276

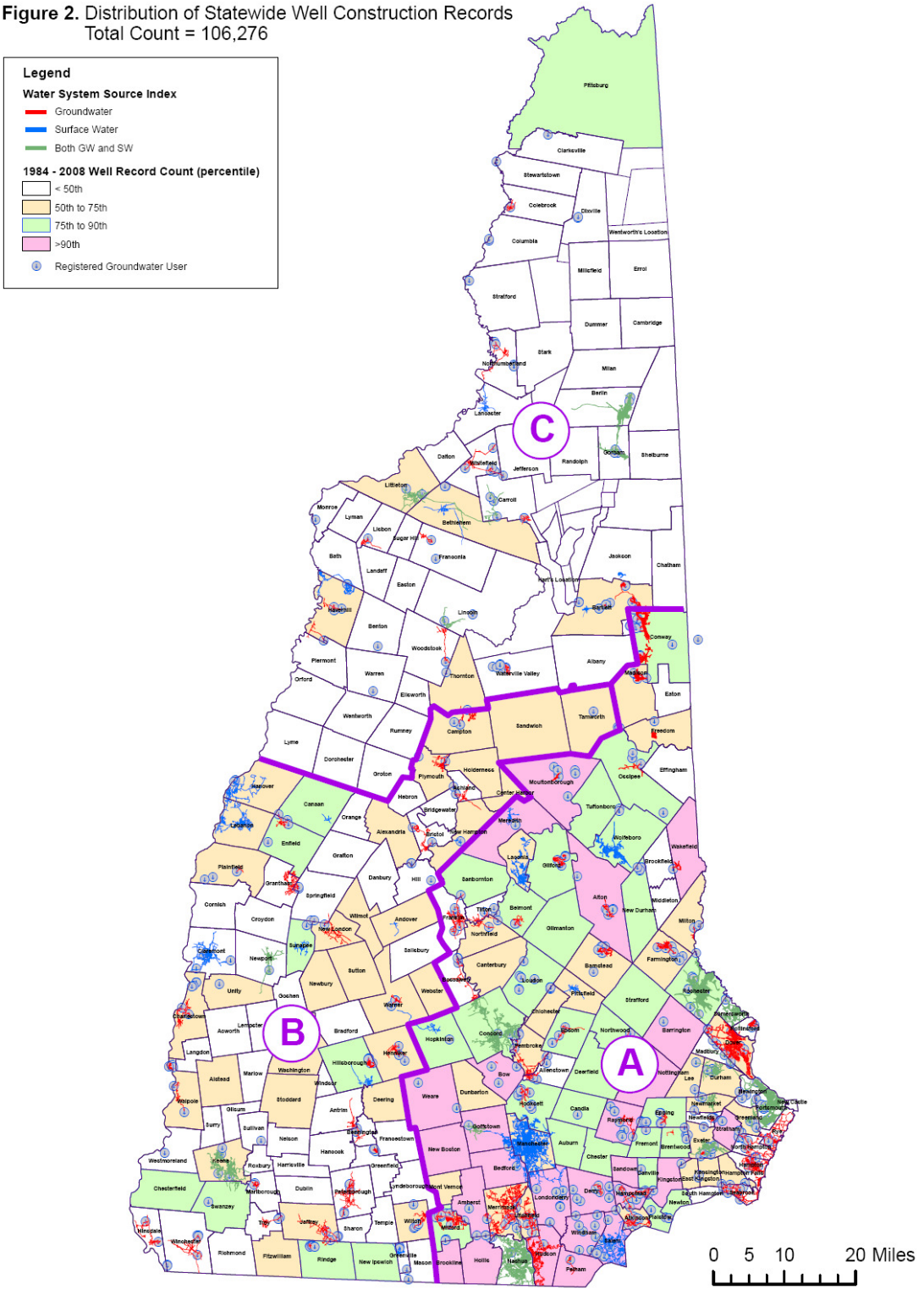
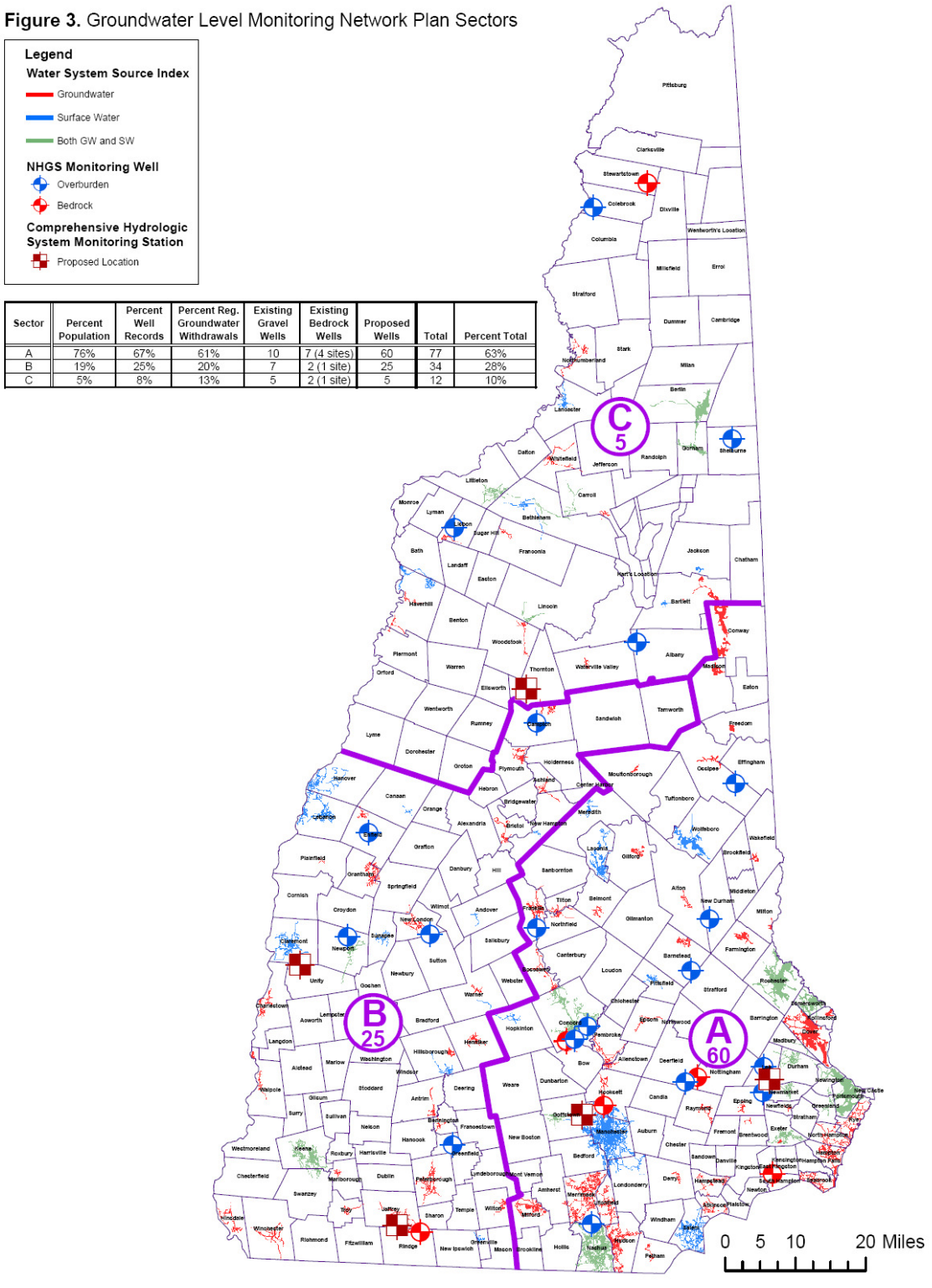


Figure 3. Groundwater Level Monitoring Network Plan Sectors



Sector	Percent Population	Percent Well Records	Percent Reg. Groundwater Withdrawals	Existing Gravel Wells	Existing Bedrock Wells	Proposed Wells	Total	Percent Total
A	76%	67%	61%	10	7 (4 sites)	60	77	63%
B	19%	25%	20%	7	2 (1 site)	25	34	28%
C	5%	8%	13%	5	2 (1 site)	5	12	10%